SCIENCE

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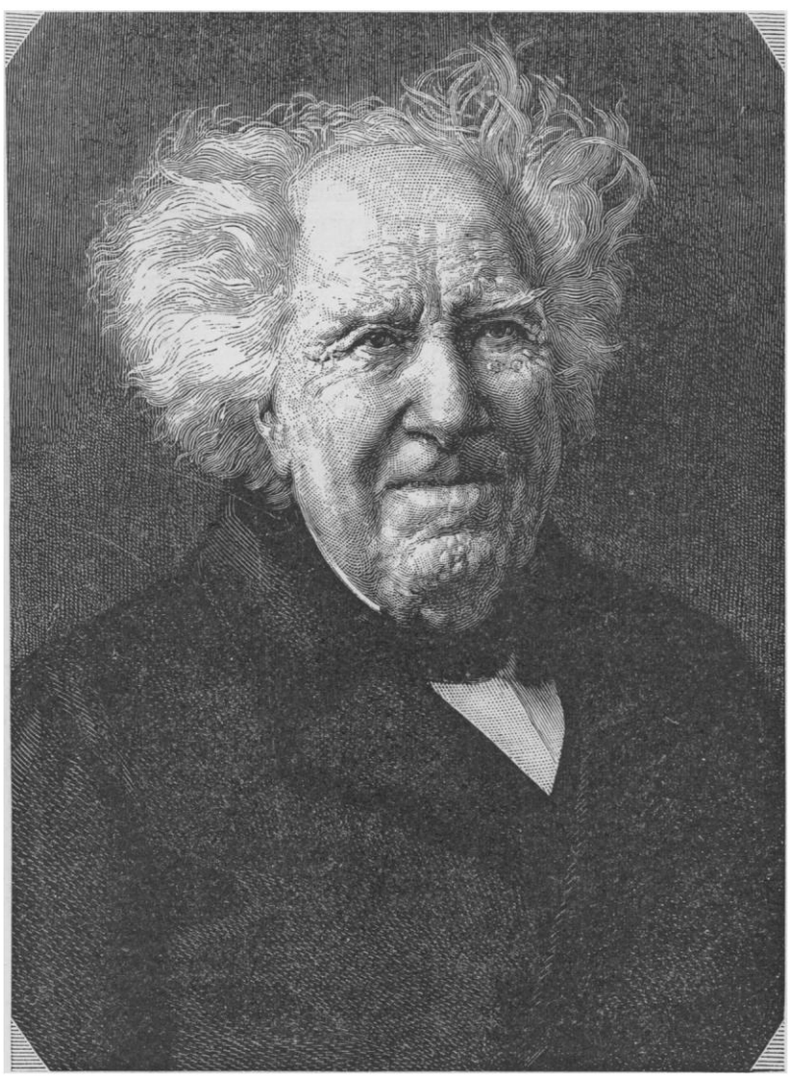
MICHEL EUGENE CHEVREUL.

MICHEL EUGENE CHEVREUL, the distinguished French chemist, died in Paris, April 9. He was born Aug. 31, 1786, in Angers. His father was a well-to-do physician in Angers, professor in the medical faculty, and a talented writer. Old age seems to be hereditary in the family; Chevreul's father having died at ninety-one, and his mother at ninety-three years.

After the revolution the University of Angers was disestablished, a school for chemical and physical studies being put in its place; which school Chevreul attended between the ages of eleven and seventeen. In 1803, Chevreul went to Paris, where his aptitudes were quickly noticed. In 1806 he was appointed director of Vauquelin's laboratory, and professor in the Lycée Charlemagne, and during the same year he published the results of his first experiments. In 1806 seven papers came from his pen, of which three were on coloring-matters (indigo and Brazilian wood). Four years later he was appointed *aide-naturaliste* in the Museum of Natural History, then examiner for the Ecole Polytechnique; and at thirty he was professor of chemistry in the Gobelins, the world-known manufactory of tapestry, and director of the department of tinctorial baths. In 1826, after the death of Proust, Chevreul was appointed member of the Academy of Sciences. Not one of his colleagues of that time is now living. In 1830 he became professor in the museum, and some time after director. He never missed a meeting of the Academy of Sciences up to his one hundredth birthday, and it is not long since one could meet him in the Rue des Ecoles, walking to the Institute, hat in hand, and hands behind the back. He seemed to have an aversion to hats, and dispensed with them a great deal.

During the war of 1870 he remained in Paris. It was in a letter written during January, 1871, to Abbé Lamazon, in answer to a note of the latter, that Chevreul used for the first time the expression he preferred when speaking of himself, — "the dean of French students."

Chevreul married early, but his wife died more than twenty years ago. His conjugal life was a very quiet and happy one. Chevreul had only one son, a retired magistrate, who died recently. He himself lived alone in Paris.



M. CHEVREUL, THE FAMOUS FRENCH CHEMIST.

(Died at Paris, April 9, aged 102 years.)

As a man, Chevreul had a very pleasant expression, and always greeted strangers or friends in a very hearty fashion. His life was a quiet one, devoted wholly to work and study. He was a rich man, as he spent little, and his income exceeded by a great deal his expenses. A few years ago he sometimes went to balls, and was a favorite with many ladies. He had a humorous turn of mind. Recently, when accepting a new assistant, he exclaimed, "Well, you must be plucky to become my assistant: I have already killed four!" "Killed" is a metaphor, but no more so than it is when used in speaking of a commander who has killed two or three horses; that is, has had them killed under him.

Chevreul's material life was simple; he eat little. Two eggs and a slice of patty were enough for the morning, with some milk and coffee; in the evening, a full plate of soup, a cutlet, and some fruit, some cheese, and only water or beer, no wine at all.

A catalogue of Chevreul's works would be a work in itself. The two most important branches of science studied and developed by Chevreul are the chemistry of fatty substances, and the theory of complementary colors. By his researches in the former of these, Chevreul gave methods for obtaining a number of very important and useful substances, such as stearine, glycerine, etc. Millions have been earned by the application of his methods. A statue of Chevreul was unveiled at the Paris Museum on his hundredth birthday.

THE SMITH ELECTRIC CONDUIT SYSTEM.

THE Smith conduit is an hermetically sealed tube or box, preferably of wood, properly treated by any process calculated to resist moisture and rot, which is laid midway between the rails of any car-track. This conduit or tube contains the electric conductor or supply-wire on its inside bottom surface, insulated from loss by leakage, corrosion, or wear; and its upper or exposed surface is covered with a series of non-magnetizable metallic plates, each about four feet in length, which are screwed down on to strips or sheets of insulating material, and each insulated from its neighbor, so that the surface of the conduit becomes a strip of metal, broken up into sections of not more than four feet each, from which the car, in passing along over its surface, may take off and use a current of electricity, provided they are, for the time being, directly connected with the source of supply at the bottom of the conduit.

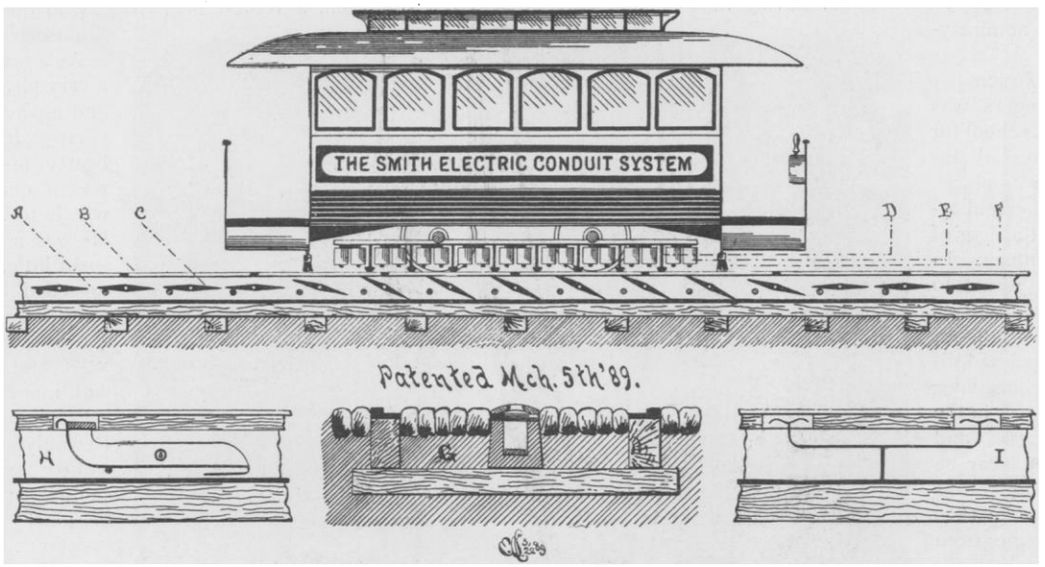
This connection is made in the following manner (see cut): At distances of one or two feet apart, movable connecting pieces are attached to the electric conductor, and rest thereon by gravity until such time as they are attracted from above. The car is provided with a row of magnets on its under surface, which pass along close to the metallic top of the conduit, and, in passing, attract by magnetic influence the connecting pieces before referred to, each of which is provided at one end with a small soft-iron armature. It will thus be seen that as these "connectors" each rises up in its turn through small holes in the top board of the conduit, on touching the lower part of the surface plate, they form a direct electric connection between the cable and such top plates as the car and its magnets cover; so that such parts of the top plates, and only such parts, are always in electrical connection, and form the medium from which the car in its passage is supplied with its current, and power for its electro-motor. It will be noticed that there is no dependence placed on any one connector, but that the magnets are at all times holding up a number of them, or all which may at any one time be beneath the car; and as these connections are constantly being made ahead of the car in its passage, while at the same time broken behind it, the direct attachment of the motor with its source of supply is never broken, and there is no "sparking" between the contact-pieces and the conductor, and no danger of burning out dynamos or connections.

In this system an underground electric supply is given for use where overhead wires are not desired. As the conduit is hermetically sealed, and without any slot or opening whatever, it cannot catch rain, snow and dirt, etc. Immunity from danger is claimed, as the surface of the conduit is dead, and contains no current of electricity, excepting such portions as are covered by the car or cars. By the use of large conductors and a current of low tension, the loss by leakage is reduced, and should almost cease to be a factor in our calculations. The inventor claims that from actual experiments he is assured that this loss, even at such points as may be covered by cars, and under unfavorable circumstances, such as heavy rain and flooded streets, cannot exceed two or three per cent.

The conduit, being not over nine inches deep by five in width, can be laid directly on the cross-ties of the ordinary street-railway track without any cutting of timber or alteration whatever, while it may also be carried around sewer man-holes and ordinary street obstructions. In the case of a single-track road, the benefits of this system are obvious, as the conductor may be branched through all switches and turnouts, and no car can be without power, or light at night, at any point on the road.

The company claims, that, under the patents granted March 5, a conduit can be laid down ready for use at not more than one-half the cost of any other underground system.

It is a part of the plan, as covered by patents, that a blower, or exhaust-fan, or combination of both, should be used to keep a constant current of air passing through the conduit tube at all times, in order to keep its interior free from moisture of condensation, and all its parts thoroughly insulated. This air-current will also serve to detect leaks caused by damage to the conduit from any cause, and insure its immediate repair.



A, longitudinal section of conduit; *B*, insulated top plates; *C*, connectors; *D*, electric brushes; *E*, electro-magnets under car; *F*, sweeping brooms; *G*, vertical section of conduit and track: *H*, scale-beam connector; *I*, steel spring or band iron connector.

A "non-magnetic shield," not shown in the cut, covers the magnets, and prevents the picking-up of iron fragments from the surface of the track, and insures the full efficiency of magnet-power for the purposes for which it is intended.

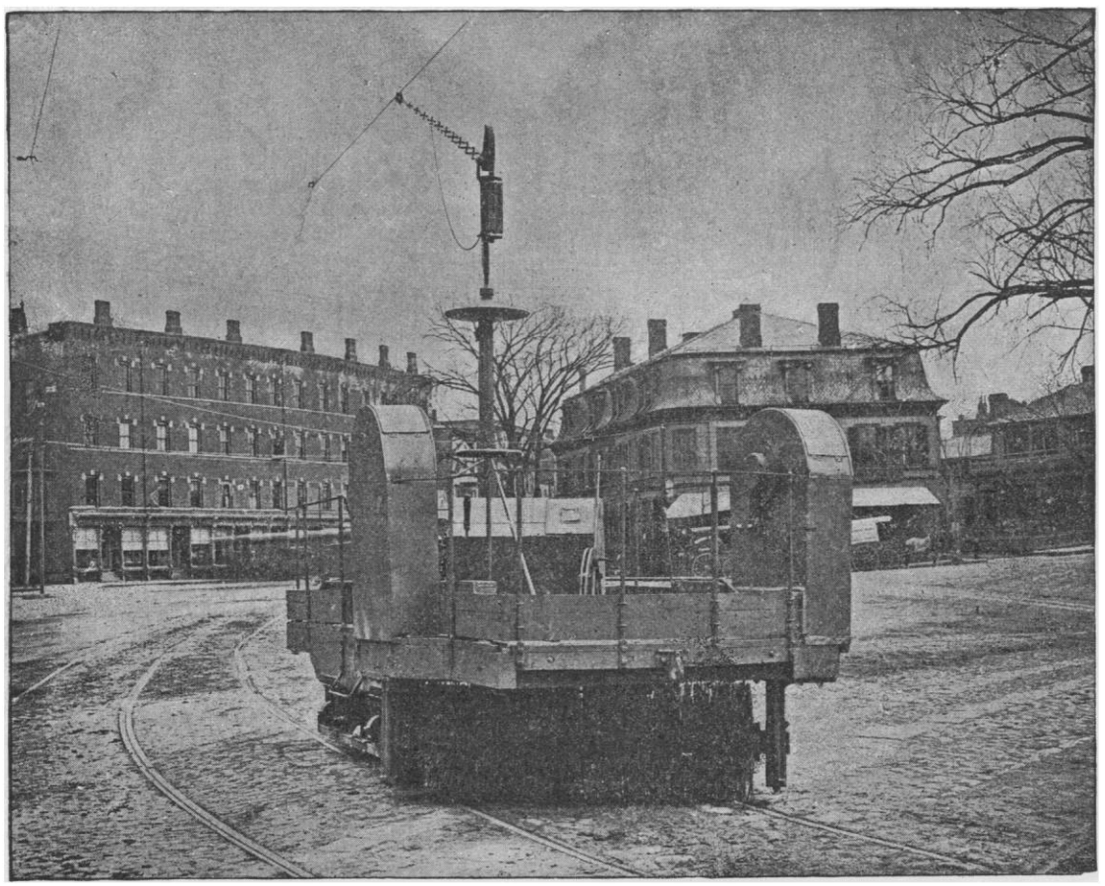
Each car is provided with brooms at either end, to sweep off surface dirt on its passage, and insure good connections to the rubbing or frictional contact of the electrical brushes or shoes which follow, and carry the current to the motor, from which, after having done its work, it passes off to either rail or the ground. The illustration shows the simplest forms of scale-beam levers used as "connectors," and not necessarily the form preferred in use.

A full investigation as to the merits of the system is invited by Harry W. Smith, the inventor, and the Smith Electric Conduit Company, 120 Broadway, New York.

A COMPOSITE photograph, nearly life-size, of eleven members of the faculty of Washington and Lee University, has been taken upon one sensitive-plate with a total exposure of forty-four seconds, each person receiving an exposure of four seconds. The photographer was Mr. Miley of Lexington, Va.

SNOW-BROOM FOR USE ON ELECTRIC RAILWAYS.

ANTICIPATING the usual New England winter, the Thomson-Houston Company designed a snow-broom (shown in the accompanying cut) for use on the Cambridge division of the West End Street Railway. The truck, which is of the Brill type, and has a five-foot wheel-base, is equipped with a thirty-horse-power motor geared to drive the truck at a speed of twelve miles per hour. The snow-broom is thirty inches in diameter, and set at an angle of forty-five degrees. It is driven by a stationary motor of twenty horse-power, at a speed of one hundred revolutions per minute. But two men are required to operate the broom, the brakes and controlling mechanism being placed in such a position as to render it an easy matter. The broom was used for the first time during the snow-storm of March 31, and performed admirably; and it was also tested by placing bricks and boards in front of it, and the way these were brushed aside to a distance of four or five feet from the track leaves no doubt of the ability of this appliance to cope successfully with heavy storms. The company has also built a much larger machine, with thirty-six-inch wheels, and fitted with two brooms and a scraper, which will be able to deal with the severest storms.



THE THOMSON-HOUSTON SNOW-SWEEPER.

THE EXTENSION OF THE METRIC SYSTEM.

THE question whether the employment of the metric system is growing or not, was recently discussed in a note presented to the Académie des Sciences by M. de Malarce. An abstract of this appears in "Publications of the American Statistical Association," New Series, No. 4.

M. de Malarce begins by stating that in 1887 the states where the decimal metric system was obligatory comprised a population of 302,000,000 inhabitants, — an increase of 53,000,000 since 1877; the states where the metric system was authorized by law as optional (England, certain British colonies, Canada, the United States) comprised 96,900,000 inhabitants, — an increase of 19,000,000 since 1877; and the states where the metric system was legally admitted in principle, or partially applied, as in the customs (Russia, Turkey, British India), comprised a population of 395,000,000, — an increase of 54,000,000 since 1877.

The metric system is thus legally recognized throughout the civilized world by 794,000,000 people, — an increase of 126,000,000 since 1877. These 794,000,000 represent 60.6 per cent of the population of the civilized world; that is to say, of countries which have a census or an official enumeration of the population. These latter contain 1,311,000,000. China, Japan, and Mexico have different systems, decimal but not metric. They represent a population of 474,000,000. The other civilized nations not comprised in the figures given above have neither the decimal nor the metric system. They represent but a slight fraction of the civilized world, — less than 43,000,000.

If we pass to the examination of monetary systems, it will be noticed that the five states that formed the monetary union of 1865 — France and her colonies, Belgium, Italy, Switzerland, and Greece — comprise a population of 111,000,000. Four states — Austro-Hungary (since 1870), Monaco (1879), Finland (1878), Russia (1887) — coined certain pieces in conformity with the French system, which are receivable, according to a decision of the French Government, at her public banks, and in consequence are legal tender in France. These states represent a population of 144,000,000.

Four states in Europe, — Roumania (1867), Spain (1868), Servia (1873), and Bulgaria (1877), — one state in Africa, — Kongo (1877), — one state in Asia, — Persia, — and nine states in America, — the Argentine Republic, Bolivia, Chili, Columbia, Hayti, Nicaragua, Peru, Uruguay, and Venezuela, — have also coined money according to the French system; and these represent a population of 56,000,000. The total population, therefore, of the states which have coined money similar to the French system, comprise 311,-

000,000 as against 162,000,000 in 1877. These 311,000,000 equal 23.7 per cent of the population of the civilized world.

Besides these states which tend to the French monetary system, and to an international circulation, there are certain notable exceptions; as, for example, England, Canada, Germany, the Netherlands, Scandinavian Union, Turkey, Morocco, Portugal, China, Siam, Japan, the United States, and Brazil.

EXCAVATIONS FACILITATED BY FREEZING.

ABOUT seven years ago Mr. Herman Pœtsch of Aschersleben, Germany, conceived the idea that excavations through difficult ground could be facilitated by freezing it by means of cold brine circulated through pipes inserted down to rock or impervious

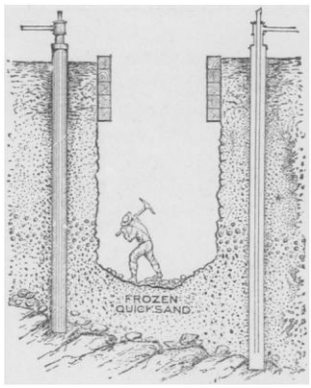


FIG. 1.

material; these ground-pipes being perfectly closed at the lower end, and containing a smaller pipe open at the lower end, down which the brine is pumped, rising in the outer pipe, and returning to an ice-machine to be cooled again.

After some experiments made with a small apparatus, which were so far satisfactory as to make it evident that the process was a success, he undertook the completion of a shaft partially sunk at the Archibald Mine, near Schweidlengen, Germany, which resulting successfully has induced its application in many coal-fields

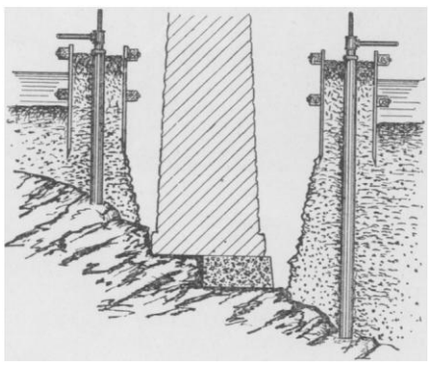


FIG. 2.

throughout Germany, France, and the Netherlands. There was much need, in Germany especially, of some way of getting to the beds of lignite and coal, of which there are many covered with beds of quicksand that are almost impassable. This process has added materially to the area of available coal-fields. The greatest depth yet reached in this way through water-bearing strata is 250 feet, although there is no limit to the depth capable of being reached; and there has been no failure to accomplish the work undertaken.

Fig. 1 shows a shaft being dug and partially timbered up. In practice it is usual to place pipes about 8 inches in diameter, and about 3½ feet apart, in a circle around the space to be excavated. It is of great importance that the pipes be perfectly closed, and that they extend not only to the rock, but far enough into it to allow any surface fissures to be frozen, thus preventing as far as possible percolation through the ledge.

Fig. 2 shows the process applied to an excavation for a bridge-pier, the frozen wall surrounding the excavated space being in effect a coffer-dam. By its application in this way, the last difficulty is removed in the way of bridging the great rivers having deep alluvial beds, where the depth to rock is so great as to preclude pneumatic foundations; i.e., greater than one hundred feet below the water surface.

It has been applied once to tunnelling. In digging under a hill occupied by residences in Stockholm, it was feared that the movements of the ground would cause the buildings to settle and crack. The inner end of the tunnel was formed into a freezing-chamber, and cold air at a temperature of −67° F. was circulated through it, which effectually hardened the sand to a depth of five feet from the surface, making a material resembling sandstone rock. The freezing was continued ten or twelve hours, and then excavation and walling-up proceeded with for the same length of time. About one foot per day was made in this manner. It is often desired to make excavations in this way adjacent to or under buildings where there is danger of undermining the foundations.

The owners of the American patents, The Pœtsch-Sooysmith Freezing Company of New York, have made several improvements in its application to tunnels especially. The first application of the freezing process in this country was in digging a shaft for the Chapin Mining Company at Iron Mountain, Michigan, where a rectangular shaft 15½ feet by 16½ feet in the clear, and 95 feet deep to the ledge, was sunk through quicksand and bowlders. Twenty-six 8-inch pipes closed at the lower end were sunk to the ledge in a circle 29 feet in diameter; and a Linde machine, having a refrigerating capacity of fifty tons of ice per day, cooled the brine. This work was very successful, the ledge being reached in seventy days after the ice-machine was started. A shaft at Wyoming, Penn., is now being constructed in the same way.

THE LIGNITE INDUSTRY IN GERMANY.

AMONG the number of new industries which are making their way in the world, the manufacture of briquettes from the brown coal or lignite deposits in Germany is one which has of late made considerable strides. This process is well described in *Engineering* of March 22. Up to within the last ten or fifteen years, these tertiary deposits of lignite, or half-formed coal, were not utilized in commerce, and were only worked in a small way by the local peasants for consumption in their cottages. Even this small trade almost died out with the introduction of cheap coal, due to the extension of the railway system, as, owing to the fifty per cent of moisture which the lignite contained, it was impossible for it to stand transport or to compete with coal.

The beds of lignite in Saxony, and on both banks of the Rhine near Cologne, are from ten to twenty yards thick; and, as they are only covered by from five to ten yards of gravel, they are easily worked in the open as quarries, the gravel being removed and used for filling up as the working of the lignite advances. The lignite is of a dark-chocolate color, and, as its consistency is about that of cheese, it can be easily and cheaply worked by means of the pick and shovel.

Near the surface it contains slightly more moisture; but, taking an average of the whole thickness, it amounts to about fifty per cent. The decomposition of the wood is not in all places perfect; and stumps, roots, branches, and trunks of trees are sometimes met with. When these occur too frequently, the lignite is not so well adapted for making briquettes, as, owing to the wood being of a still fibrous nature, it cannot be so readily reduced to powder, which is absolutely necessary for its manufacture into fuel, though of course these remains of trees can be burnt as ordinary wood, and are indeed so utilized. As a rule, however, the mass of the bed is friable, and can easily be crushed in the hand.

With regard to the formation of these deposits, there are in Germany two theories. The one is that these masses of lignite were formed in precisely the same manner as the coal-seams, but

that they have not undergone the pressure to which the coal-beds were subjected, although, as in the case of the coal, the wood of which they were formed grew on the spot now occupied by the beds or seams. The other theory is, that the wood was washed down by the rivers from mountainous forest regions, and deposited in quiet bays of the river, where it finally decomposed, and formed the lignite of to-day.

The following are various analyses of lignite in its manufactured form, after having been dried and pressed by machinery, but without the addition of any foreign matter. Indeed, such is never added, nor is it necessary, the lignite containing within itself all the properties necessary for making it into a cleanly, cheap, and efficient combustible. The similarity of these lignite briquettes to wood as regards their heating effects, and the ashes left, will be noticed in the analyses.

Analyses of Lignite Briquettes.[1]

Date.	Mine.	Moisture.	Ash.	Number of Grams Necessary to Melt One Gram of Lead.	Centigrade Heat Units per Gram.
March 16, 1887.....	Fishbach	18.66	4.9	18.1	4235
" 21, 1887. ...	Rottgen	17.6	6.2	16.9	3954.6
" 21, 1887....	Bruhl	13.6	5.4	18.6	4352.4
" 21, 1887.....	Rodder Gruble	14.6	5.4	17.9	4186

Owing to the great thickness of the bed, the working expenses are very low; and, when worked in the open, the raw material can be delivered at the works for seven pence per ton. No explosives are necessary, and as a rule the lignite is loaded direct at the working faces into the wagons of a wire-rope railway, which convey it to the mill.

In some cases, as at Honem, near Cologne, the workings are all under ground, owing to the great thickness of the layer of gravel which covers the lignite. The method pursued in these cases for working the lignite is precisely similar to the "pillar and stall" system adopted in collieries. Great chambers are cut in the lignite, and supporting pillars are left. The proportion which can be extracted by this means is about two-thirds of the mass. The surface of the ground above the workings sinks and cracks, and has to be made good, even at considerable cost; so that, whenever possible, the open system should be adopted.

The lignite rests in some cases upon a bed of pure bluish-white clay, as at Kalscheuren, and in others upon a bed of white sand. In either case the material is utilized. The clay makes beautiful white ornamental bricks and piping, while the sand finds a ready sale for a multitude of purposes. At Herzengorath the lignite rests upon this bed of sand, the sand itself being occasionally hard, and in thin beds of friable sandstone. At this mine the concession is surrounded by the collieries of the Aix-la-Chapelle basin; but as the uses for the two kinds of fuel, coal and lignite, are so different, the competition is not dreaded, the more especially as the coal cannot be burned in the stoves as at present used for burning wood; and it is as a substitute for wood, which is largely used as fuel on the Continent, that briquettes of lignite find especial favor.

The great difficulty which stood in the way of the utilization of the raw lignite consisted in the necessity for rapidly and economically driving off the excess of water it contained, and in doing this in such a manner that the quantity left could be easily controlled and regulated. Absolute dryness is by no means necessary, nor is it aimed at, and for the following reason. The lignite, like the wood of which it is composed, contains a certain amount of resinous matter; and the secret of the compressing of lignite into briquettes, and of their cohesion in that form, is this very resin which is contained in it. The pressure to which the lignite is subjected in order to form it into briquettes is enormous, and at the moment of compression it develops very considerable heat; so much so, that the hand can barely support the temperature of a newly formed briquette. Supposing for a moment that absolutely dry lignite were fed into the press, as indeed was first done: the result would be that the heat developed would be so intense as to carbonize the resin, and the briquette would have no consistency or solidity, but would crumble to pieces.

In order to obviate this, numerous series of experiments have proved that the lignite, as it enters the press, must contain eighteen per cent of water, and that this amount of water is sufficient to so modify the heat as to prevent the carbonization of the natural resin, allowing the resin to attain to a sticky state only. This, combined with the force of the blow, forms a solid briquette with a polished surface, which does not soil the hands, and which is not easily broken. A constant stream of cold water is kept in circulation around the press, so as to cool it as much as possible. The briquettes, as they leave the machine, are steaming; and the blow given to the succeeding briquette is utilized to impel those which have preceded it, straight into the railway-wagons, along channels formed of wood, but having at the bottom two iron rails to diminish the friction. By this means hand-labor is avoided for the transport, and the lignite is not touched from the time it enters the mill in the raw state until it enters the railway-wagon and is sent off to the consumer.

The briquette industry is increasing from year to year, the existing works are putting up additional presses to increase their output in accordance with their increased orders, while one or two new companies have recently started, and are in a fair way to success.

[1] The analyses were made by a qualified chemist of Cologne.

THE CHINCH-BUG IN ILLINOIS.

THE economic entomology of Illinois has been distinguished, during the last four years, by the longest period of continuous chinch-bug devastation known in the history of that insect; but, as evidences of the disappearance of this outbreak began to accumulate last fall, it is perhaps not too soon to write its history.

Mr. S. A. Forbes, the State entomologist, states that its beginnings were apparent in 1885, when noticeable injuries to corn were reported from ten counties of southern Illinois; in 1886, thirty counties of that region were seriously damaged, Washington County (about the centre of destruction) being perhaps worst infested; in 1887 the loss was severe in thirty-eight counties of the southern district, and very noticeable in thirty-seven others of northern and western Illinois; while in 1888 small grain and corn were heavily infested throughout all the southern counties, favorable weather alone enabling the crops to withstand the injury better than the year preceding. The attack was now considerably diminished in the centre of the affected area; but farther to the east, in Clay, Richland, and Crawford Counties, it was much heavier in the beginning of the season than the preceding year, its force decreasing, however, with the disappearance of the first generation. On the extreme southern borders of the State, on the other hand, it continued with undiminished severity, the damage done in 1888 being greater than that in 1887, — greater in Pope and Pulaski Counties than ever before since their settlement. There was thus apparent a wave-like propagation outward from the centre above mentioned, the crest of the wave of increase requiring two years to pass from Washington County to the Ohio River. A similar gradual increase northward was demonstrated by a comparison of the numbers of chinch-bugs in the early spring of 1887 with those of the summer and fall, in the counties of Montgomery, Christian, and Shelby.

The recent wide-spread appearance of three destructive contagious diseases of the chinch-bug, and a consequent diminution of its numbers, make it seem at last unlikely that any extraordinary loss will follow this year in the territory which has been so long infested.

From the observations and studies reported, it appears that severe drought in the middle and latter part of the summer may diminish the number of the chinch-bug by lessening the food-supply

of the generations then breeding and hatching, and may operate also to protect the crops of the following year, at a distance from woodlands, by driving the adult chinch-bugs from the open fields, and compelling them to resort to the grassy woods for food for themselves and their young.

Severe drought in a small-grain district has so thoroughly and so early destroyed the corn-crop there, as to test practically the effect of abandoning that crop as a defence against the chinch-bug. In the case observed it was found that the injury the following season was very much less than before. As the drought took effect, however, on the field-grasses generally, and thus still further reduced the supply of insect-food, the result was not to be attributed wholly to a lack of corn.

A similar destruction of the corn by drought in midsummer, followed by a general winter-killing of wheat, has shown that a successive abandonment of these crops may greatly reduce the numbers of the chinch-bug, even where other conditions are very favorable to it; this reduction amounting, in one such case, to one-half or three-fourths of the number abroad the year preceding.

Where wheat is abundant in a district very badly infested by chinch-bugs, it is now certain that this insect may live and breed very successfully in early spring in oats, in young timothy and blue-grass meadows, and even in corn.

A thoroughgoing investigation of the relations of chinch-bug injury to the acreage of the principal farm-crops of Illinois in 1886 and 1887 shows, that, where the outbreak was but just beginning, the wheat area had evidently much to do with the number and the rate of increase of the insects; a rising gradation of injury appearing in correspondence to an enlarging area in wheat, the acreage of the other crops at the same time remaining nearly constant or slightly declining. As the severity of the attack increases, however, the oats area begins to rise with the wheat, and may presently surpass the latter as a stimulus to the multiplication of the chinch-bug, corn and grass finally showing a like tendency where it has become excessively abundant and destructive. Here, when the eggs of the winter brood are being laid freely on all the food-plants of the species, the wheat area may even decline as one passes from districts where destruction is very great to those in which it is complete. This may be due to one or more of the folfowing circumstances: (1) the wheat area may be purposely diminished by the farmers one year after another, as was certainly sometimes the case in southern Illinois in 1887, where chinch-bug injury had greatly lessened the yield and value of the crop for the season or two preceding; (2) a change of feeding-habits may arise among the insects themselves; or (3) there may be a spontaneous gradual shifting of the centre of attack, due to a natural diminution in the number of insects one year in places where they were the year before the most abundant, and an increase in places where they were then less numerous. This territorial propagation outward from a centre of first excess is accompanied by a diminution in numbers in the principal area of origin; and a similar propagation from districts where the crop most preferred and first infested (wheat) is most abundant, to adjacent districts where the leading crops are those freely fed upon, but less preferred (oats, grass, etc.), is also highly probable, but less easily demonstrated. In both cases the diminution in numbers is doubtless largely due to the direct and indirect consequences of over-crowding, — a condition which always arouses or intensifies the action of the natural checks on excessive increase.

Further comparison of the crop areas of 1886 with the injuries of 1887 shows that a very decided diminution of the corn area has had little or no effect to diminish the loss to small grain the following year.

From this we learn that the proper procedure respecting the grass and the cereal crops in the presence of a chinch-bug uprising is the prompt and early adandonment of wheat or a decided limitation of its area, to be followed presently, if the attack continues, by a diminution of the oats acreage also, and the sowing of clover, whenever practicable, instead of the grass forage-plants. We also find that these measures must be taken early or not at all; since, if too long postponed, they may easily do more harm than good.

An analysis of the published opinions of economic entomologists shows a general and rather indiscriminate dependence on the abandonment of wheat-culture as a defence against the chinch-bug; this opinion being more positive, however, among the older entomologists than among those who have studied the question recently. A similar indiscriminate but not unanimous opinion as to the advantage of the abandonment of wheat appears in the statements of two hundred agricultural correspondents of the office, eighty-seven per cent of the replies to an inquiry touching this matter being in the affirmative.

From the miscellaneous experiments reported, it appears that the worst-infested fields of small grain may be sustained under a chinch-bug attack by heavy fertilization, if the land be originally in good condition; and that, in general, the damage done will vary inversely to the fertility of the soil and the support given by fertilizers to the crop attacked. The best fertilizers for this purpose, on the wheat-lands of the central part of southern Illinois, seem to be, first, barn-yard manure; and, second, the phosphates and nitrates combined.

The kerosene emulsion, whose deadly effect on the chinch-bug was first shown by Mr. Forbes in 1882, has repeatedly proven a very valuable agent in the hands of farmers when applied in the field for the protection of corn; but it may best be used in combination with some obstruction to the passage of the chinch-bug from small grain and grass to corn, — either ditches and furrows, or belts of coal-tar along the border of the field. A mixture of coal-tar with oil or grease, ten parts to one, will last, without hardening in the sun, from five to ten times as long as the pure tar, but is too fluid to be poured directly on the ground.

Tobacco-water was found frequently fatal to chinch-bugs of all ages, but was apparently less effective than the kerosene emulsion. An emulsion of coal-tar likewise gave promise of usefulness, having the advantage in cost over the kerosene mixture, but being somewhat less convenient of application.

On the other hand, infusion of lobelia, coal-tar water, turpentine emulsion, lime-water, fresh gas-lime, arsenic, London purple, Paris green, the "Egyptian insecticide," buhach, corrosive sublimate, and steam, were applied to chinch-bugs with discouraging results.

Some starvation experiments not begun until Sept. 4 were unsatisfactory, because of the lateness of the period, and because most of the bugs from the district where the specimens used were collected, proved to be already weakened by disease. Adults and young, some just hatched, confined on a dry surface and without food, died in from one to six days. Other young, taken as they hatched, lived from twelve to twenty-four hours.

Careful studies of the contagious diseases of chinch-bugs, revealed in August and September, 1888, the presence of three distinct forms of fungous disease, two of them identical with those reported by Mr. Forbes in 1882, and the third new. All these were widely distributed through southern Illinois, with the possible exception of the region bordering the Ohio River.

Two of these diseases are produced by thread fungi (*Entomophthora* and *Botrytis*), which make a rapid external growth after the death of the insect, presently embedding the body in a snow-white mould; and the third is a bacterial disease, characterized by a minute bacillus, which has its principal seat in the cœca (not the Malpighian tubules) of the alimentary canal. Many and various culture experiments with the latter were completely successful; but infection experiments could not be made for want of specimens originally free from disease. On the other hand, culture experiments with the *Entomophthora* and *Botrytis* were tried without success.

Among various miscellaneous notes, Mr. Forbes reports the failure of an attempt to force the chinch-bug to feed on wild buckwheat (*Polygonum dumetorum*); the very early occurrence of the chinch-bug in Edwards County, Ill. (in 1823, and again in 1828); the prostration of wheat and corn as an effect of chinch-bug injury, due to failure of development of the latest circle of "brace roots;" the harmlessness and uselessness of the flea negro bug, often found associated with the chinch-bug in wheat; the place and time of deposition of the eggs for the second brood; the protective value, under certain circumstances, of the sowing of timothy with wheat in the fall; the successful defence of corn-fields by ploughing and ditching against an invasion from small grain; and an important modification of the mode of destruction by burning in the spring.

THE WAGNER REGULATOR.

THIS electric regulator, invented by Mr. Frank C. Wagner of Ann Arbor, Mich., consists essentially of a high-resistance wire stretched tightly between two supports, and carrying a weight at its middle. The actuating current passes through this wire, which is selected in such a manner as to heat thereby, thus allowing the weight to descend a fixed amount for each strength of current. The weight carries a bar adapted to make contact successively with a number of spring contact-pieces, which are in electrical connection with a number of resistance-coils so arranged as to shunt varying portions of current around the device requiring regulation.

The field for the application of this form of regulator is very wide. Up to the present time, it has been applied practically to only two cases. The first was to compensate for extreme variations of speed in an incandescent dynamo. The wire of the regulator was placed in series with an incandescent lamp fed from the main conductors. Any increase of voltage due to an increase of speed immediately increased the expansion of the wire, thus dropping the weight, and throwing additional resistance into the field-circuit of the dynamo. Before the application of the regulator, lamps were being burnt out continually by sudden increase of speed. This regulator, although very crudely made, has been in use for nearly a year, and with excellent results.

The second application is in connection with an electric meter, also invented by Mr. Wagner. This meter uses the heating action of the current for the actuating force, and in consequence the direct readings are proportional more nearly to the square of the current than to the current itself. The regulator is employed to shunt such portions of the entire current around the meter proper as will render its readings directly proportional to the current strength.

There are many other ways in which the regulator can be applied, especially in connection with alternating currents. Its extreme simplicity, and the very small amount of energy consumed, are greatly in its favor.

HEALTH MATTERS.

The Hughes Crematory.

THE city of Savannah, Ga., is soon to have a crematory for the destruction of garbage by fire. The model selected is that known as the Hughes Crematory, and is thus described by the *Savannah News*:—

The crematory will be about 30 feet long, and from 15 to 20 feet wide. The main body of the kiln or furnace is a vertical shaft built of brick. At its base will be two hydrocarbon-burners. Upper and lower triangular flues extend across the middle of the shaft, and also an upper and lower set of baffles or side-wings, which are connected by means of wall passages or flues. Underneath these is a shelf, forming a retort in which air may mix with the flames from the burners. Flues are provided for the return of the gases arising from the incineration to a smoke-stack at the side of the shaft. A hydrocarbon-burner is placed at the bottom of the shaft conveying the gases to the chimney, which deodorizes them before they pass out into the air. Perforated steam-pipes are located over the top drop-shelf of the shaft, connecting the burner with the boiler, so that the fluids may be carried off.

The operation of the crematory is simple. When the furnace is brought to the required degree of heat, a load of the material to be burned is emptied into the top of the shaft. It falls on the first drop-shelf. After a suitable period this shelf is dropped, and the mass of material is allowed to fall on the second shelf, and a second is dumped into the kiln. After another interval the second drop-grate is allowed to fall, and the material is thrown upon the baffles and flues below, whence the residuum finally drops down into the ash-pit at the bottom of the shaft. The capacity of the crematory will be 50 tons of garbage per day, and the cost of the process is from 18 to 20 cents per ton.

In Montreal it costs just $43,000 to destroy by fire a year's miscellaneous refuse, and $8,000 additional for the burning of its night-soil. The destruction of the latter costs 75 cents per ton, and of the former 25 cents per ton. In Minneapolis it is estimated that 15 to 20 cents per ton of refuse pays for the labor employed and the fuel used. Within five days recently the refuse cremated consisted of 33 horses, 59 hogs, 103 barrels of hotel and commission-house refuse, 12 loads of market offal, and 70 loads of manure. The aggregate weight was 200 tons, but the ashes deposited in the course of consumption weighed considerably less than 1,000 pounds. The total cost of labor and fuel for this five days' period was $38.25.

THE MORPHINE HABIT. — Erlenmeyer says that children born of women addicted to the morphine habit are practically morphine-eaters from birth. During the first few days of life, unless morphine is given to them, they are very apt to suffer collapse; and this condition may end in death, the child being too weak to withstand the violent symptoms, which are similar to those which follow the sudden withdrawal of the drug in adult opium-eaters.

SCHOOLROOM SPACE. — Mr. H. Courthope Bowen, whose opinions on all matters connected with the proper construction of schoolrooms are entitled to great weight, and are regarded as authority by the leading medical journal of England, expresses somewhat as follows what, in his judgment, should be considered a good schoolroom. Taking the case of a room 14 feet high, fairly ventilated and always well aired in recess, he would assign two thirds of the floor-space to the scholars and their desks, and keep the other third for the teacher, the blackboard, etc. With single desks, 22 inches should be allowed from side to side, and 3 feet from back to front, for each scholar. The passages need not be more than 18 inches for those running from back to front, and 1 foot for those running from side to side. In such arrangement, counting the passages, each scholar has (without reckoning the share of the space allotted to the teacher) a trifle more than 40 inches from side to side, and just 4 feet from back to front. In a room 25 feet by 20 feet the floor-space for scholars' desks will be 16 feet by 20 feet, with 4 feet from back to front per row, and accommodation is provided for twenty scholars. The whole floor-space is 500 square feet, and the cubic contents of the room 7,000 cubic feet, with 20 square feet and 280 cubic feet per person.

SULPHUR FUMIGATION. — Fumigation by the burning of sulphur is the most common method employed by boards of health in the disinfection of apartments in which contagious disease has existed, and the clothing worn by the patients during their illness. In an address delivered by the distinguished chemist, Dr. E. R. Squibb, before the Kings County Medical Association, he called attention to the fact that there must always be an abundance of watery vapor in the room to be disinfected; otherwise the sulphurous-acid gas generated by the burning of the sulphur is not an efficient disinfectant. The same is true of chlorine gas when used for disinfecting purposes.

DRIED POTATO. — In the *Voënno-Sanitarnoië Dëlo*, Dr. Jakov M. Shmulevitch emphatically draws attention to dried potato as an important food-article, possessing some very valuable advantages in comparison with the vegetable in fresh state. The advantages claimed for the article are these: (1) while fresh potatoes easily rot, blacken, and sprout, dried potatoes, when kept duly protected from moisture, remain in the best condition for a very long time; and (2), being by far lighter and less bulky than fresh potatoes, are by far more convenient for preservation and transportation, which point has a great practical importance, especially in time of war. To be fit for culinary use, the article requires a preliminary maceration in water for about ten or twelve hours.

SPONTANEOUS COMBUSTION. — The following case of spontaneous combustion is reported in the *British Medical Journal* by Dr. Booth: "On the morning of Sunday, Feb. 19, I was sent for to examine the remains of a man, aged 65, a pensioner of notoriously intemperate habits. I found the charred remains of the man reclining against the stone wall of the hay-loft. The main effects of combustion were limited to the corpse, and only a small piece of the adjacent flooring and the woodwork immediately above the man's head had suffered. The body was almost a cinder, yet retained the form of the face and figure so well that those who had known him in life could readily recognize him. Both hands and the right foot had been burnt off, and had fallen through the floor into the stable below, among the ashes; and the charred and calcined ends of the right radius and ulna, the left humerus, and the

right tibia and fibula, were exposed to view. The hair and scalp were burnt off the forehead, exposing the bare and calcined skull. The tissues of the face were represented by a greasy cinder, retaining the cast of the features, and the incinerated mustache still gave the wonted military expression to the old soldier. The soft tissues were almost entirely consumed. On my return from other work, later on, I found that the whole had been removed. The bearers told me that the whole body had collapsed when they had tried to move it *en masse*. From the comfortable recumbent attitude of the body, it was evident that there had been no death-struggle, and that, stupefied with all the whiskey within and the smoke without, the man had expired without suffering, the body burning away quietly all the time."

THE SUPPRESSION OF SMALL-POX. — An outbreak of small-pox is reported to have occurred recently in Minneapolis, and the health-officer of that city is credited with having summarily and successfully dealt with it. According to *The Journal of the American Medical Association*, as soon as a case was announced, a consultation was called to determine if the disease was small-pox. That being settled, the patient was removed to the quarantine hospital for treatment. The house where he lived was quarantined, and all the people directly exposed were confined in it. Dr. Kilvington's assistants then began to look up all people indirectly exposed, and vaccinated them. Quarantine houses had guards stationed about them, who allowed no one to go in or out during the season of quarantine. The quarantine people were vaccinated, and during the time until it could be determined whether the vaccination would take, they were supplied with food. When the vaccination took, the person under quarantine was bathed, given new clothing in the place of the old, which was burned, and he was then discharged. When a house had been emptied of people under quarantine, the bedding and curtains were burned, sulphur burned in all the rooms, and the walls sprayed with corrosive sublimate. None of the inspectors or guards were allowed to enter any of the houses under quarantine, when there was danger; and *the doctors that did the vaccinating saturated their clothing with the corrosive sublimate before and after entering a house where there had been small-pox*. The clothing and bedding were either paid for at a reasonable price by the board of health, or were replaced by new articles. In one of the houses quarantined, *there were 31 laboring men who were inclined to object to the rules of quarantine*. One escaped, but he was taken back when found, *and a guard, with a rifle and instructions to shoot* should he attempt to escape, was put over him. Since Jan. 13, six thousand people have been vaccinated, and the schools, public and private, have been systematically visited, and unvaccinated children vaccinated. The absurdity of saturating the clothing of the vaccinators before and after entering each house where there had been small-pox is self-evident. Nor do we believe that in this enlightened age any guard would be instructed by a health-officer to shoot a laboring man who, after being shut up forcibly in a house where a case of small-pox had been, should attempt to escape, especially when the house had been disinfected, and the man himself vaccinated. The account above given must, we think, have been obtained from some source outside the health-office of Minneapolis.

ELECTRICAL NEWS.

Canal-Boat Propulsion.

A PAPER read by Mr. H. C. Vogt at the last meeting of the British Association for the Advancement of Science brought out some interesting and remarkable facts. It gave the results of some experiments made with air-propellers at Copenhagen. A steam-launch was fitted with a windmill with steel blades, carried on a frame above the deck, and provided with steam machinery to rotate it. The *London Electrical Review*, in describing the experiment and suggesting a modification of the method, says that at first sight the method would seem an extremely inefficient one as regards application of power to so unstable a medium as the air; but when it is remembered that recent investigations of the marine propeller have established it as a true re-action engine, in which a large slip is not necessarily an accompaniment of inefficiency, it will appear that there is nothing wrong in the principle indicated by Mr. Vogt. An air-propeller is a pure momentum or re-action machine. Practically it was found that a twenty-foot launch of five and a half feet beam could be driven at a speed of five knots per hour in calm weather, and against a fresh breeze at four knots. The engine producing this effect indicated one and one-half horse-power. For a single indicated horse-power, the thrust of the propeller was 36.7 pounds, or about the same as a water-propeller. It might be supposed that in a contrary wind this thrust would disappear; but, on the contrary, through 75 per cent of the horizon the thrust was found to be augmented by the wind. With a larger launch, having a displacement of five tons, a speed of over six knots an hour was obtained, against the wind. In some of the trials, canvas-covered wings were used, but they were found inferior to steel.

To replace the steam-engine used in these experiments, the *Review* suggests an air-propeller carried well above the decks on a standard, driven by an electric motor which is carried on top of the frame, supplied with current from a wire running along the canal, and connected with the motor through flexible conductors and a carriage travelling on the main wire. The blades of the propeller should be of steel, accurately shaped, and arranged to be turned at a greater or less angle according to the direction of the wind. Thus equipped, a canal-boat could make her way with a speed exceeding that generally used, and with no greater proportionate expenditure of power than that existing in all cases where the trolley system of actuating electric motors is in use.

The advantages of the system are obvious. The hull of the vessel would be entirely clear of machinery, and the entire weight of the propelling apparatus carried by the boat need not exceed that of an ordinary tow rope. No disturbance of the water of the canal would be produced, except such as would be due to the progressive movement of the hull of the vessel. It would seem as though in this suggestion might be found a solution of the mechanical driving of canal-boats, — one that, from the points of view of simplicity, non-occupancy of the hull of the boat, and minimum disturbance of the water, would be nearly perfect.

The air-propeller works with an entire absence of vibration. It requires ten or twelve times the area of the corresponding water-screw. As the thrust is a perfectly quiet one, and, if due to the motion derived from a dynamo, would be free from the jarring inseparable from the motions of a heavy reciprocating engine, and as it is cushioned in all its motions by the high elasticity and mobility of the air, a very light frame would serve to carry the wheel. A thrust of 75 to 150 pounds would be all that the frame would be required to resist, — a thrust that would always be brought on it gradually, and would be gradually released. In steam canal boats a very considerable portion of the hull is occupied by the engine, boilers, and coal-bunkers, while the constant eddies and currents produced by the propeller are destructive in their effect on the sides and bottom of the canal. This is all done away with in aerial propulsion. The establishment of a line of poles and wire would not represent the tithe of the cost of a fixed or travelling towing-cable.

INFLUENCE OF LIGHT ON MAGNETISM. — A preliminary notice of a very interesting experiment has been given by Mr. Shelford Bidwell. The investigation was undertaken to determine whether a piece of iron could be magnetized by allowing a ray of light to fall on it. Of course, if light is an electrical vibration, and if an effect was sought using an ordinary piece of iron, there would be no result, since the opposite vibrations would exactly neutralize each other's effects. But iron can be prepared so that it is more susceptible to a magnetic force acting in one direction than to one acting in the other. Ewing has shown, that, if a piece of iron which is being magnetized in what we call the positive direction has the magnetizing current reduced to zero at such a point in the operation that the current and the magnetization of the iron become zero at the same instant, then that piece of iron, although apparently in a neutral condition, is more susceptible to a negative than to a positive magnetizing force. So, if a piece of iron prepared in this way be submitted to the action of a ray of light, the positive and negative magnetizing forces produced, although equal, will not balance with one another, but the latter should produce an effect. On trying the experiment in this way, Mr. Bidwell ob-

tained a sudden throw of the magnetometer-needle, denoting the magnetization of the iron, followed by a slower motion due probably to the heating effect of the light. While Mr. Bidwell does not consider the results as altogether free from suspicion until all possible disturbing causes have been eliminated, yet, if further research confirms the results already arrived at, the experiment is most important. The last year has added many proofs of the fact that light is an electro-magnetic disturbance, but none are so conclusive as this would be.

THE PURIFICATION OF SEWAGE.—Last year we described the plan proposed by Mr. W. Webster for the purification of sewage by electrolytic methods. It has been since tried on a large scale, and with encouraging results. The process is very simple, and is described by the *London Electrician* as follows: "The color, density, and constitution of the London sewage varies from hour to hour in the most extraordinary manner; but the first sample to be dealt with was of a light-yellow color, looking something like weak tea with a little milk in it, but, so far as could be seen, it contained very little solid matter in mechanical suspension. This having been poured into a test-jar, a current was passed through it between a pair of iron electrodes, with about six volts electromotive force. An extremely rapid effect was produced. In less than two minutes the jar was seen to be filled with a flocculent precipitate, which was gradually carried upward by the bubbles of liberated hydrogen. After about three minutes, the electrodes were withdrawn, and the precipitate left to collect at the top. In actual practice, after the effluent has passed into the settling-tank, the precipitate, in the course of about two hours, loses the whole of the entangled hydrogen; it then sinks to the bottom of the tank. The sludge thus formed is similar to that produced by the chemical processes now in use, except that the electrical method possesses the obvious advantage that the total quantity of material has not been increased by the addition of chemicals." But, besides this precipitation, there is an action on the organic matters in solution which robs them of their unpleasant and harmful properties. In the larger experiments carried on at Crossness, two 20-horse-power engines are used, with an Edison-Hopkinson dynamo. Iron plates are placed in the shoot through which the sewage is discharged. In travelling along the shoot, every particle of the sewage comes in contact with the plates, and finally the whole is received into the settling-tanks. With 27 horse-power, it is possible to treat a million gallons of sewage in twenty-four hours. The consumption of iron in actual working is about two grains per gallon. Taking a town with a daily flow of ten million gallons of sewage a day, — corresponding to a population of about 300,000, — the consumption of iron should not exceed 304 tons per annum, and the steam-plant required would be about 250. This plant takes the place of the mixing-tanks, machinery, and chemicals employed in the chemical process for the purification of sewage; and, if such electrical plant is designed to meet the peculiar requirements of the district, it should cost less than any other method, besides precipitating and purifying in one operation.

SECONDARY BATTERIES. — We are informed that in the United States Circuit Court, April 9, Judge Coxe approved of the disclaimer filed by the Electrical Accumulator Company, and formulated the decree and injunction restraining the Julien Electric Company, their officers, agents, and workmen, from further manufacture, use, or sale of secondary batteries of the Faure type, in which the active material is applied to the support in the form of a *paint, paste, or cement.*

NOTES AND NEWS.

THE "Atlantic Pilot Chart for April" says of whirlwinds, water-spouts, and tornadoes, that these phenomena are of the same general character; and it has been found, that, whenever they occur, it is in connection with a general cyclonic storm of large area. The principles involved in their formation are almost identical with those that determine the formation of a tropical cyclone; that is, great contrasts of temperature and moisture between adjacent layers of air. In the United States and off our coasts they may therefore naturally be expected to occur to the southward of a storm-centre, where cold, dry northerly winds blow over and mingle with warm moist air from the southward. That they may occur to the north of a storm-centre, however, under certain conditions, is indicated by a report from Second Officer Madge, of the British steamship "Lake Winnipeg," Capt. Murray. This vessel encountered a severe cyclonic storm Feb. 27, latitude 40° 50′ north, longitude 56° 48′ west; and at 2.30 P.M., when it was blowing a strong gale from the east, a whirlwind was observed moving due west. The barometer was low, and the warm, moist east wind was evidently underrunning a cold, dry current of air from the area of high barometer to the northward, where readings of 30.4 inches and upward are reported. It will thus be seen that local conditions of pressure, temperature, and moisture may cause exceptions to the general rule.

— The lectures to the summer class in botany, of the College of Pharmacy of the City of New York, by Professor Joseph Schrenk, commenced Wednesday, April 10, and will be continued every Wednesday until the end of June. By request of several members of former botany classes, Professor Schrenk will also give a course in practical microscopy.

— The Essex Institute of Salem, Mass., was organized March 1, 1848, under a charter granted by the Legislature in February of that year, having for its objects the collection and preservation of whatever relates to the geography, antiquities, and civil and ecclesiastical history of Essex County; the formation of a cabinet of natural productions in general, and more particularly those of the county; the promoting a taste for the cultivation of choice fruits and flowers; its three departments then being history, natural history, and horticulture. The scope of the institute has been from time to time enlarged, and there are now departments of history, science, literature, art, and horticulture. The library of the institute, which in 1848 numbered fifteen hundred volumes, now numbers fifty-one thousand volumes, and embraces all the departments of literature, but is mostly useful for reference. A reading-room is the latest addition to the library department, and this is well supplied with historical, scientific, and art periodicals, besides the usual magazine literature of the day. The museum of the institute now contains a large and valuable collection of antiquarian and historical relics, portraits, paintings, engravings, medals, coins, paper currency, manuscripts, etc., and is in process of systematic arrangement. The scientific collections, which before 1867 had grown to be so large and of such value that it was impossible for the institute at that time to bear the expense of properly caring for and exhibiting them, were, by agreement entered into between the institute and the trustees of the Peabody Academy of Science in May, 1867, deposited with the last-named institution, where, properly labelled, arranged, and preserved, they are made available to the public, and form an attractive feature of the academy's museum at East India Marine Hall. The publications of the institute regularly issued are the *Historical Collections*, which have now reached Vol. XXV.; *The Bulletin*, which has reached Vol. XXI., and contains records of the regular meetings and field-meetings of the institute, and special papers on scientific subjects; the *Annual Report*; besides occasional monographs, etc. The rooms of the institute contain portraits of the officers of the Essex Historical and Essex County Natural History Societies, the forerunners of the institute; old prints; silhouettes; a great number of interesting relics; historical portraits by Copley, Smibert, Trumbull, and others; antique furniture; local relics; and military costumes. A fire-proof room holds the large and invaluable collection of manuscripts. The meetings of the institute are held on the first and third Mondays of every month. During the winter months, papers are read; and field-meetings are held throughout the county every summer for scientific and historical investigation and discussion. Without considerable endowments in the past, the institute has been able to do for the civil history and archæology of Essex County — and no other county in America offers a better field for such research — what has been so well done for the natural history of the county, a cherished object of the institute, by the well-equipped and earnest workers of the Peabody Academy of Science. With largely increased facilities and resources, which it owes to the general appreciation of its work, it is now ready to go forward, as

the means shall come to hand, to a still larger measure of usefulness and honorable effort.

— From his recent experiments on explosive mixtures of petroleum vapor and air, Col. Majendie concludes, says *Engineering*, that one volume of liquid benzine will render 16,000 volumes of air inflammable, and 5,000 volumes violently explosive. Though these results show that great care is necessary in storing benzines and crude petroleums, other of his experiments are more re-assuring, as he has found that neither a glowing coal, sparks from a flint or steel, or a flameless fusee, will ignite the most explosive mixture of petroleum vapor and air, actual contact with a flame or white-hot body being necessary.

— On Wednesday, March 6, according to *Engineering*, while a number of torpedo-boats belonging to the French Government were manœuvring off the coast at Toulon, one of them turned turtle, and three of her crew were drowned. The weather at the time of the accident was fair, with a north-east wind blowing, and a swell from the south-east. During the day every thing had gone perfectly successfully till at about 4.30 in the afternoon the boats proceeded to pass out of the Bay of St. Nazaire, between the Embezi Island and the Grand Rouveau, on their way back to Toulon. Three of the boats effected the passage in safety; but the third, No. 102, was, when partly through, struck by a heavy roller and completely capsized. Her commander saved himself by clinging to the rudder, and others of the crew also succeeded in escaping; but three of the engineers and mechanics, being in the engine-room or the stokehold, were unable to get out, and were drowned. The boat floated for forty-five minutes, and finally sank by the stern. The screw, it is stated, continued to revolve for some time after the boat had turned upside down. The No. 102 was a 53-ton boat, 114 feet 9 inches long, and belonged to a type which has been much criticised, and of which the French Government own or have ordered fifty-one specimens, most of which, it is said, have not yet been delivered, which is fortunate for the authorities. The officers of the navy have made many complaints as to the unseaworthiness of these boats. Although this has been the first one that has actually capsized, such a catastrophe has hitherto only been avoided by the exercise of the greatest care on the part of their crews.

— The Paris Exhibition authorities have not yet decided upon the plan to be adopted as to jury examinations of exhibits, or as to reports and awards; nor indeed is it by any means settled whether there will be any juries, reports, or awards at all. One thing, indeed, seems quite certain, — that there will be no distribution of medals, the utmost that would be done being the possible giving of diplomas of different shades of merit. Upon the whole, the chances appear in favor of a total abandonment of the jury and award system, and in its place the substitution of an official document given to every exhibiter, certifying his presence at the exhibition. The object of such a certificate does not appear very clear. So far as England is concerned, the editors of *Engineering* believe that the general feeling of exhibiters will be against the granting of awards; and this for several reasons. At Manchester and Glasgow, the abandonment of the system, which has been gradually falling into disrepute, was favorably received by the exhibiters, who are always — excepting, of course, the recipients of medals and diplomas — opposed to juries' reports, which they regard as more or less superficial and prejudiced. More especially will this objection hold good in Paris, where the very small proportion of British jurymen will render it almost impossible for English exhibiters to obtain a fair proportion of recognition in the general struggle of each country's representatives. But if the decision be taken, and we think it will be a wise decision, to follow the example that has been set in England, and abandon all attempts to pronounce on the respective merits of exhibiters, the present exhibition offers a splendid opportunity for a new departure in official recompense. The idea has been, we believe, submitted to M. Berger by a member of the British committee, and is receiving due attention. It is that awards, in the form of medals or diplomas, should be given to those men whose names are famous in industry and science, and whose works have been so distinguished that the fruits they have borne appear in all parts of the exhibition, though the distinguished workers themselves take no part in it. The number is limited, and the list would not be difficult to prepare, for the names of such men are familiar to all the world. Pasteur, Chevreuil, Dumas, Gramme, Eiffel, De Lesseps, Bessemer, Wylde, Swan, Armstrong, Edison, Bell, Alvan Clarke, are conspicuous examples of those whose labors have advanced civilization in all its branches. So, too, those societies all over the world, whose mission it has been successfully to promote industry and science, could be appropriately recognized; for, without their help and co-operation in the general cause of advancement, the Paris Exhibition of 1889 would have fallen miserably short of its present measure of success.

— *Bradstreet's* states that a company has been formed under the laws of New York State to develop large deposits of ozokerite, a natural paraffine wax existing in the Wasatch Mountains of Utah Territory, about 113 miles east of Salt Lake City. These mines are said to contain the only deposits of this mineral known to exist, outside of Galicia, in Austria, whence the entire world's supply of this product has until recently been obtained. The Austrian mines are said to yield a product inferior in quality to that discovered in Utah. The uses of this mineral are constantly enlarging, and in this country alone the consumption amounts to 500 tons yearly. The chief uses of the mineral in its crude state are in the manufacture of waxed paper, in the lining of wooden vessels, in varnish and blacking manufacture, and in the insulating of electrical wires. The American product is said to differ from the Austrian article in that it does not need refining, but comes direct from the mine ready to be melted and applied, while the Austrian product must be refined in order to be applied to its numerous uses. When refined, this mineral is used in the adulteration of beeswax and as a substitute for that article in candle-making, the manufacture of matches and dolls, and in the making of heavy lubricants. In its natural state it is found in veins varying from ten to twelve inches thick, and varies in color from a light yellow to brown and black. Baryslaw, in Galicia, a town of 12,000 inhabitants, is dependent entirely upon the mining of this product for its existence. The price of refined ozokerite, commercially known as "ceresin," ranges from 20 cents per pound for chemically pure white, down to 6 cents per pound for crude black of a poor quality. The company proposes to mine 1,500 tons of the wax yearly, and pay 7 per cent on a capital stock of $1,250,000. The first shipment from the American mines arrived in New York in January this year, and attracted considerable comment.

— In its forecast of the weather for April on the Atlantic, the United States Hydrographic Office states that westerly winds, of less force, however, than during March, will prevail over the transatlantic steamship routes east of the 60th meridian: west of that meridian, and along the Atlantic coast of the United States, the winds will be variable. Gales may be expected about once a week north of the 32d parallel. But few northers will be felt on the Gulf, and those that do occur will be of less duration than earlier in the season. Icebergs and field-ice may be encountered between 40° and 50° west, and as far south as 41° north; fields may also be met with inshore as far west as the 65th meridian. Considerable fog will be experienced off the Grand Banks and the coast of the United States as far south as Hatteras. The north-east trades, having reached their southernmost point during March, will this month begin to extend farther north.

— The alleged resistance offered by American grape-vines to the ravages of the phylloxera has recommended those vines to wine-growers of Europe, where the pest has made its presence felt. Much uncertainty has existed among the growers as to the particular variety best adapted to resisting the insect ravages, and some disagreement has also been noted between those who favored grafting American cuttings on French vines and those who proposed to replace the French by the American article entirely by planting the latter in the place of the former. Dr. Geza Von Horvath, of the Hungarian experimental station, who has been studying the subject for seven years past, has published in detail the results of his experiments, recently referred to in *Bradstreet's*. There is but one American variety, and that the *Vitis rotundifolia*, or Scuppernong, that will successfully resist any and all attempts of the pest upon its roots. Unfortunately the European growers

will not plant this grape, owing to its, to them, unpalatable taste, and also to the fact that European vines will not graft well with it. All other varieties of American vines are more or less liable to infection. Many varieties are said to be as vulnerable to the pest as any European vine. Many varieties depend on differing soils and other conditions to render them free of the infection. The Concord grape is classed as one that offers resistance to the pest only under exceptional circumstances. Other varieties which are more or less liable to infection are the York, Madeira, Herbemont, Jaquez, Cunningham, Clinton, Taylor, Elvira, and Othello. All American varieties not covered by the above names, it is said, either do not withstand the phylloxera at all, or have not yet been sufficiently tested as to their ability to do so.

— The French Government has appointed an international congress on the subject of mines and metallurgy, to be held in Paris on the 2d of September in this year, in connection with the exposition which is to take place there during the next summer. The congress has for its object to make known and discuss the most recent inventions and improvements in mining and metallurgy, and will have brought before it a considerable number of memoirs which have been prepared by engineers specially detailed for the purpose. These reports will be printed and distributed in advance to persons who wish to become members of the congress, and will form the basis of the discussion; but other subjects may be introduced or other questions presented by the members, with the approbation of the officers in charge. The congress will consist of members and honorary members, the honorary members being appointed by the French Government, and the members becoming so upon the payment of twenty francs. Letters and communications from this country relating to the subject of mines and metallurgy may be addressed to Mr. Castel, inspector-general of mines, and president of the organizing commission, 144 Boulevard Raspail, Paris. The committee appointed by the French Government consists of, president, Mr. Castel (inspector-general of mines, president of the Society of Mineral Industry); vice-presidents, Mr. Brüll (past-president of the Society of Civil Engineers in Paris), Mr. Haton de la Goupilliere (member of the institute, inspector-general of mines, director of the School of Mines of Paris), Mr. Jordan (professor of metallurgy at the Central School, past-president of the Society of Civil Engineers of Paris), and Mr. Rémaury (civil engineer of mines); secretaries, Mr. Dujardin-Beaumetz (secretary of the central committee of coal-mines), Mr. Gautier (civil engineer of mines), Mr. E. Gruner (civil engineer of mines), and Mr. Lodin (engineer of mines, professor of metallurgy at the School of Mines in Paris).

— It is said that John G. Borden of New York, who spends his winters in Florida, has offered a prize of $1,000 to the Florida city which shall, on July 1, 1889, present the most cleanly appearance.

— Mr. Whitman Cross presents, in an article in the *American Journal of Science* for April, an account of a newly recognized tertiary formation, which, while of very limited geographical extent, yet possesses characteristics of importance in several directions. The points of interest brought out may be grouped as follows: 1. The formation in question occupies a portion of the area about the city of Denver, Col., hitherto assigned to the Laramie cretaceous; 2. The conglomerates and sandstones of the formation are chiefly made up of materials derived from a great variety of andesitic lavas, of whose outpouring and destruction alike there is no other record now known; 3. The celebrated fossil-plant beds of Table Mountain, at Golden, belong to the Denver formation, hence the taxonomic value which has been given to this rich flora must be considered subject to revision; 4. The vertebrate remains are of individual importance, and also present some very remarkable associations, which are apparently in direct conflict with all past observations.

— An electrical and industrial exhibition is to be held in Birmingham, England, during the months of August, September, and October. A very large amount of support has been promised for it, and there is every prospect that it will prove a success. The electrical department will be divided into three sections: the first including all kinds of machinery and apparatus for electric lighting; the second relating to complete displays of electric lighting on various systems; and the third comprising telegraphs, telephones, phonographs, electric bells and clocks, electric welding and smelting, electrotyping, telpherage, and miscellaneous apparatus. The industrial section will consist largely of Birmingham manufactures and manufacturing processes, although it will include many other subjects. The former will be specially interesting. The small trades of Birmingham form a *terra incognita* to the engineer, and an immense amount of ingenuity is exercised in producing the numberless small articles which are turned out from the capital of the Midlands.

— A "graphic" exhibition is to be held at Stuttgart next June, in celebration of the King's Jubilee. This exhibition is limited to firms or institutions of Wurtemberg. It will comprise the following sections: 1. All branches of the publishing business, such as books, musical works, and periodicals, as well as other auxiliary arts and processes, viz., engraving, lithography, chromolithography, xylography, zincography, photography, etc.; 2. Collections of kindred articles belonging to, or represented by, subjects of Wurtemberg; 3. Bookbinders' work, book tools and stamps; 4. Paper, and wares manufactured from the same; 5. Mechanical processes in operation, especially in the form of type-founding and accelerated printing-presses; 6. An historical display of ancient specimens of the graphic arts, as also of ancient Wurtemberg, artistic journals, illustrations, bindings, caligraphy, etc. The Royal Library at Stuttgart, which possesses one of the richest collections of Bibles, will alone provide a choice display of manuscript and printed books.

— Dr. J. H. Kidder of the Smithsonian Institution died April 8, at his residence in Washington, from an attack of pneumonia. Dr. Kidder served as a surgeon in the navy until he resigned, about twelve years ago. Since that time he has been connected with the scientific branch of the government service. Under Professor Baird, he was connected with the Fish Commission, and latterly he was director of the International Exchange, in the Smithsonian Institution. He leaves a wife, daughter of ex-Postmaster-General Maynard of Tennessee, and three children.

— At a meeting of the American Academy of Arts and Sciences, April 10, in Boston, the Rumford medals were presented to Professor Albert A. Michelson.

— The Société Botanique de France has decided to take advantage of the universal exposition to invite botanists who may be in Paris to a congress during the last half of the month of August, 1889. Those who take part in the congress can present papers on botanical subjects, pure or applied, with which they may be especially familiar. The society also intends to take advantage of the presence in Paris of a large number of prominent scientific men to bring forward for discussion a number of leading botanical questions. Among these will be the preparation of a botanical map similar to the geological maps prepared under the auspices of the Geological Congress and the aid which anatomy can furnish in classification.

— The unsightly efflorescence on walls, due to what is termed "saltpetring," and noticed generally in dry weather, is due, according to *Building News*, to several causes. Perhaps the only satisfactory explanation is that the newly built brick wall is exposed to dampness, or dampness in co-operation with something in the bricks themselves. It is stated that bricks made from clay containing iron pyrites are subject to this efflorescence; that the sulphur from the fuel converts the lime or magnesia into sulphates; and that whenever the bricks dry the sulphates evaporate, leaving behind the crystalline appearance or efflorescence. The evil is therefore due to the chemical action that takes place between the sulphur in the fuel and the magnesia in the clay. The mischievous part of the efflorescence is that it destroys the pointing, and injures the work generally. Remedies are few. The chief object is to stop up the pores with some solution of fatty matter, quicklime, and cement powder; but the main thing is to avoid the particular clay and coal fires employed to make and burn the bricks, and to mix the mortar with animal fat.

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CONTENTS:

THE NEWS of Stanley's journey from Yambuya to Mvutan Nzige confirms the view formerly expressed, that his object of relieving Emin Pacha has failed. From his report we learn that Emin, rather, had to relieve him, and, by furnishing men, has enabled him to return to the Kongo. The results of Stanley's wonderful journey will undoubtedly be of the greatest importance to science, as they will clear up the geographical relations between the Kongo basin and the lakes of the upper Nile. Regarding the appearance of this region, Stanley says: "We were one hundred and sixty days in the forest, — one continuous, unbroken, compact forest. The grass-land was traversed by us in eight days. The limits of the forest along the edge of the grass-land are well marked. We saw it extending north-easterly, with its curves, bays, and capes, just like a seashore. South-westerly it preserved the same character. North and south the forest area extends from Nyangwe to the southern borders of Mombuttu. East and west it embraces all the country from the Kongo, at the mouth of the Aruvimi, to about east longitude 29°. How far west beyond the Kongo the forest reaches, I do not know. The superficial extent of the tract described totally covered by forest is 246,000 square miles. North of the Kongo, between Upoto and the Aruvimi, the forest embraces another 20,000 square miles. Between Yambuya and Mvutan Nzige we came across five distinct languages. The land slopes gently from the crest of the plateau above the Mvutan down to the Kongo River, from an altitude of 5,500 feet to 1,400 feet above the sea. North and south of our track through the grass-land the fall of the land was much broken by groups of cones or isolated mountain ridges. To the north we saw no land higher than about 6,000 feet above the sea; but bearing 215° magnetic, at a distance of 50 miles from our camp on the Mvutan, we saw a towering mountain, its summit covered with snow, probably 17,000 or 18,000 feet above the sea. It is called Ruevenzori, and will prove a rival to Kilma Njaro. I am not sure that it may not prove to be the Gordon Bennett Mountain in Gambaragara, but there are two reasons for doubting if it be the same: first, it is a little too far west for the position of the latter, as given by me in 1876; second, we saw no snow on the Gordon Bennett. I have met only three natives who have seen the lake toward the south. They agree that it is large, but not so large as the Albert Nyanza." We give the substance of Stanley's experiences at another place.

As usual, this news was immediately followed by another despatch, purporting to give further details of more recent adventures of the explorers; but, coming as it does from Brussels, it merits more serious attention than the Zanzibar news of Reuter's bureau. The telegram is dated Brussels, April 7, and says, "Advices received here from Stanley Falls state that Arabs who have arrived there report that Henry M. Stanley and Emin Pacha were heard from in February. They were then marching toward Zanzibar, with several thousand men, women, and children. They also had six thousand tusks of ivory. The Arabs who brought the news arrived at Stanley Falls in February. They claimed to have seen Stanley several months before that time." It may be that the steamer which carried this news to Leopoldville brought down Stanley's letter, which, as will be remembered, was detained for some reason or other at Stanley Falls when the first news of Stanley's return was sent to Europe. One interesting fact is learned from Stanley's report. It is the recent advance made by the Arab slave-dealers in the country north of Stanley Falls. It appears that since their first advent on the Kongo they have rapidly encroached upon the territory of the northern tributaries of the Kongo; and it also appears that at no very distant day the invaders who started from Dar For, and those who extended their raids from Zanzibar, will meet in the Welle region. In the face of these facts, the endeavors of the European nations to suppress that insignificant part of the slave-trade reaching the coast appear altogether hopeless, unless they succeed in cutting off the supply of fire-arms from the slave-dealers, thus destroying one of the principal causes of their superiority over the aborigines.

STANLEY'S LETTER.

STANLEY'S letter, although containing no more recent information than the telegram sent a few months ago, describes graphically the enormous difficulties encountered by the intrepid explorer; and his description is the more impressive on account of its briefness and of the simplicity with which the most exciting events are set forth. The expedition, which consisted of 389 officers and men, started from the camp of Yambuya, on the Aruvimi, on June 28, 1887. The very first day the natives attempted to prevent the progress of the expedition, but were unable to put any serious obstacles in its way. For seven days the expedition marched inland in an easterly direction, through a densely populated district. Evidently Stanley kept on the southern side of the river. His letter says that this course took him out of his proper direction, which tends to confirm the report that the Aruvimi runs more southerly than indicated in most maps. He again reached the river on July 5. From this date until Oct. 18 he followed the left bank of the Aruvimi. After seventeen days of continuous marching, the expedition halted for one day's rest. Aug. 1 the first death occurred, the cause being dysentery. So far, for thirty-four days, the course had been singularly successful.

Assuming that he made good progress, his first day's journey having been twelve miles, he would have been approximately north-east of Stanley Falls. Here his difficulties began. The party

now entered a wild country, in their nine-days' march through which their sufferings multiplied, and several deaths occurred. Aug. 13, on arriving at Airsibba, the natives presented a bold front, and the party lost five men from poisoned arrows. Lieut. Stairs was wounded below the heart, and suffered greatly, but he recovered. Aug. 31 the expedition met a party of Manyema, and their misfortunes began on this date. Stanley writes that he had taken the Kongo route to avoid Arabs who would tempt his men. Within three days of this unfortunate meeting, twenty-six men deserted. This must have happened not very far distant from the most southern region visited by Junker.

While crossing the region raided by Arab slave-traders, who, with their Manyema men, came from Stanley Falls, the progress of the caravan was an uninterrupted series of misfortunes. On Sept. 18 he left the station of the Arab chief Ugarrava, the expedition numbering 263 men, 66 having been lost by desertion and death, and 56 being left sick with Ugarrava. The march led to the Arab settlement, Kalinga Longa. The men lived on wild fruits, fungi, and nuts. Before reaching Kalinga Longa, Stanley lost 55 men through starvation and desertion. A slave-owner at Kalinga Longa named Ab ed Salim did his utmost to ruin the expedition short of open hostilities. He insisted upon purchasing rifles, ammunition, and clothing, so that the expedition left the station beggared. The men were absolutely naked, and were so weak that they were unable to carry the boat. Stanley was therefore obliged to leave the boat, together with 70 loads of goods, at Kalinga Longa, under the care of Surgeon Parke and Capt. Nelson, the latter of whom was unable to march. After a twelve-days' journey, the party, Nov. 12, reached Ibwiri. The Arab devastation, which had reached within a few miles of Ibwiri, was so thorough that not a native hut was left standing between Ugarrava and Ibwiri. What the Arabs did not destroy, the elephants destroyed, turning the whole region into a horrible wilderness.

It appears that Ibwiri is situated in about 29° east longitude, 126 miles distant from Lake Mvutan Nzige. In a later passage of his letter, Stanley gives the distance of Kalinga Longa from the lake as 190 miles, which leaves a distance of 64 miles for the line from Kalinga Longa to Ibwiri. The former place may therefore be situated near the sources of the Nepoko. It does not appear clearly where Stanley left the Aruvimi, but it would seem that this happened at Kalinga Longa or near it. This seems the more probable, as he left his boat there. Stanley continues: —

"Our sufferings terminated at Ibwiri. We were beyond the reach of destroyers. We were on virgin soil in a populous region abounding with food. We ourselves were mere skeletons. From 289 persons, we now numbered 174. Several of the party seeming to have no hope of life left, a halt was therefore ordered for the purpose of recuperating. Hitherto our people were sceptical of what we told them. The suffering had been so awful, the calamities so numerous, and the forests so endless, that they refused to believe that by and by we would see plains and cattle, the Nyanza, and Emin Pacha. They had turned a deaf ear to our prayers and entreaties; for, driven by hunger and suffering, they sold their rifles and equipments for a few ears of Indian-corn, deserted with the ammunition, and became altogether demoralized. Perceiving that mild punishment would be of no avail, I resorted to the death-penalty, and two of the worst cases were hanged in the presence of all. We halted for thirteen days at Ibwiri, revelling on fowls, goats, bananas, corn, yams, etc. The supplies were inexhaustible, and our people glutted themselves with such effect that we had 173 sleek and robust men. One had been killed with an arrow.

"When we started for Albert Nyanza, Nov. 24, we were still 126 miles from the lake. Given food, the distance seemed nothing. Dec. 1 we sighted an open country from the top of a ridge connected with Mount Pisgah, which was so named from our first view of the land of promise and plenty. Dec. 5 we emerged on the plains, leaving the deadly and gloomy forest behind us. After one hundred and sixty days of continuous gloom we saw the light of broad day shining all around, making all things beautiful. We thought we had never seen grass so green, or a country so lovely. The men literally leaped and yelled with joy, and raced over the ground with their burdens. Ah! this was the old spirit of former expeditions successfully completed, and all suddenly revived. Woe betide the native aggressor whom we may meet! However powerful, with such a spirit the men will fling themselves upon him like wolves on sheep. Numbers will not be considered. It was the eternal forest that had made them the abject, slavish creatures so brutally plundered by Arab slaves at Kalinga Longa.

"At Kilonga Wonga, on the 9th, we entered the country of the powerful chief, Mazamboni. The villages were scattered so thickly that no road except through them could be found. The natives sighted us, but we were prepared. We seized a hill as soon as we arrived in the centre of a mass of villages, and built a seriba as fast as bill-hooks could cut the brushwood. The war cries were terrible, from hill to hill, pealing across the intervening valleys. The people gathered in hundreds at every point, war-horns and drums announcing the struggle. After a slight skirmish, ending in our capturing a cow, the first beef we had tasted since we left the ocean, the night passed peacefully, both sides preparing for the morrow."

Here Stanley narrates how negotiations with the natives failed, Mazamboni declining a peace offering, and how a detachment of forty persons led by Lieut. Stairs, and another of thirty under command of Mr. Jephson, with sharpshooters, left the zareba, and assaulted and carried the villages, driving the natives into a general rout. The march was resumed on the 12th. There were constant little fights all along the route. The afternoon of the 13th the caravan sighted the Nyanza. The descent from the plateau, which Stanley describes as 5,200 feet above the sea, to the lake, which is 2,300 feet high, seems to have been very difficult. Besides this, the caravan had to suffer from attacks of the natives. The natives of the lake did not receive Stanley kindly, but, for lack of a boat, he was unable to proceed. There were no trees of a size sufficient to make canoes. Here the significant passage occurs, "We had used five cases of cartridges in five days' fighting on the plain; a month of such fighting must exhaust our stock;" which shows that Stanley's caravan could not be of any assistance to Emin.

His disappointment must have been great, when, after finally reaching the lake, after having overcome the greatest difficulties, he was compelled to retrace his steps in order to bring his boat, which had been left in Kalinga Longa. He continues: "On Jan. 7 we were in Ibwiri once again. After a few days' rest, Lieut. Stairs, with 100 men, was sent to Kalinga Longa to bring the boat and goods. I also sent Surgeon Parke and Capt. Nelson. Out of the 38 sick men in their charge, only 11 men were brought to the fort. The rest had died or deserted.

"On the return of Stairs with the boat and goods, he was sent to Ugarrava. He was to bring up the convalescent. Soon after his departure, I was attacked by gastritis and an abscess on the arm. After a month's careful nursing by Parke, I recovered, and set out again for the Albert Nyanza on April 2, accompanied by Jephson and Parke. Nelson was appointed commandant of Fort Bodo in our absence, with a garrison of 43 men and boys. On April 26 we arrived in Mazamboni's country again. This time, after solicitation, Mazamboni decided to make blood brotherhood with me. His example was followed by all the other chiefs as far as the Nyanza. Every difficulty seemed now to be removed. Food was supplied gratis. Cattle, goats, sheep, and fowls were also given in abundance, so that our people lived royally.

"When one day's march from the Nyanza, natives came from Kavali and said that a white man named Malejja had given their chief a black packet to give me, his son. Would I follow them, they asked. 'Yes, to-morrow,' I answered. 'And if your words are true, I will make you rich.' They remained with us that night, telling us wonderful stories about big ships as large as islands, filled with men, etc., which left no doubt in our mind that the white man was Emin Pacha. The next day's march brought us to Chief Kavali. After a while he handed me a note from Emin Pacha, covered with a strip of black American oilcloth. The note was to the effect, that, as there had been a native rumor that a white man had been seen at the south end of the lake, he had gone in a steamer to make inquiries, but had been unable to obtain reliable information. He begged me to remain where I was until he could communicate with me.

"The next day, April 23, Mr. Jephson was despatched with a strong force to take the boat to the Nyanza. On the 26th the boat's crew sighted Mawa Station, the southernmost belonging to Emin Pacha. Mr. Jephson was there hospitably received by the Egyptian garrison. The boat's crew say that they were embraced one by one, and that they never had such attention shown to them as by these men, who hailed them as brothers. On April 29 we once again reached the bivouac ground occupied by us on Dec. 16, and at 5 P.M. of that day I saw the Khédive steamer about seven miles away steaming up toward us. Soon after 7 P.M., Emin Pacha, Signor Casati, and Mr. Jephson arrived at our camp, where they were heartily welcomed by all of us. Next day we moved to a better camping-place, about three miles above Nyamsassie, and at this spot Emin Pacha also made his camp.

"We were together until May 25, when I left him, leaving Jephson, three Sudanese, and two Zanzibaris in his care. In return he caused to accompany me three of his irregulars and 102 Madi natives as porters. Fourteen days later I was at Fort Bodo. At the fort were Capt. Nelson and Lieut. Stairs. The latter had returned from Ugarrava twenty-two days after I had set out for the lake, bringing with him, alas! only 16 men out of 56. All the rest were dead. My 20 couriers whom I had sent with letters to Major Barttelot had safely left Ugarrava for Yambuya on March 16. Fort Bodo was in a flourishing state. Nearly ten acres were under cultivation. One crop of Indian-corn had been harvested, and was in the granaries. On June 16 I left Fort Bodo with 111 Zanzibaris and 101 of Emin's people. Lieut. Stairs was appointed commandant of the fort, Capt. Nelson was second in command, and Surgeon Parke was medical officer. The garrison consisted of 59 rifles. I thus deprived myself of all my officers in order not to be encumbered with baggage, provisions, and medicines, which would have to be taken if accompanied by Europeans.

"On June 24 we reached Kilonga, and on July 19 Ugarrava. The latter station was deserted. Ugarrava, having gathered as much ivory as he could obtain from the district, had proceeded down the river about three months before. On leaving Fort Bodo, I had loaded every carrier with 60 pounds of corn, so that we were able to pass through the wilderness unscathed. Passing on down the river as fast as we could go, daily expecting to meet the couriers, who had been stimulated to exert themselves for a reward of £10 per head, or the major himself, leading an army of carriers, we indulged ourselves in pleasing anticipation as we neared the goal. On Aug. 10 we overtook Ugarrava with an immense flotilla of 57 canoes, and, to our wonder, our couriers, now reduced to 17, who related an awful story of hairbreadth escapes and tragic scenes. Three had been slain, two were still feeble from wounds, and all except five bore on their bodies the scars of arrow-wounds. A week later, Aug. 17, we met the rear column of the expedition at Bunalya."

Then Stanley goes on to describe his disappointment at hearing of the disaster that had befallen his rear guard, and says that he intended to go back to the Albert Nyanza to unite with Emin.

CALIFORNIA WINES.

A REPORT by Major B. C. Truman, and published by the Los Angeles Board of Trade, expresses some optimistic views of the future of California wines, which seem likely to be realized.

No one acquainted with the varied soil and diversified climate of California can doubt that it is to that State that the American people are to look for the wines which will in time take the place of the vintages of Bordeaux, Rheims, Epernay, Oporto, Madeira, and Tokay. California may not probably produce a Chateau Lafitte, a White Hermitage, or a Chablis, for some time to come; she may never perhaps be able to produce similar wines; but, even if she succeeds in perfecting processes of wine-making, and producing brands that are rich in bouquet and aroma, they may never, in the estimation of some, reach the perfection of those just named, and otherwise not be like them. No two wine-producing countries are precisely alike, although there may be similarity of climate, soil, cultivation, and manipulation. In California, grapes are grown in all kinds of soil, altitudes, and under very dissimilar atmospheric conditions; some of these conditions of climate, soil, and altitude resembling France and Italy, others Germany and Greece, others Spain and Portugal, while not a few of the Californian conditions are totally different from those of the European wine districts. Thus, to a great extent, the result will be the production of a new type; and our vintages, with their pretty names, may sound as sweetly in the ear of the connoisseur of the next generation as do Rousillion or Amontillado in our own.

During the last thirty years improvements have been made, and are still being made, in the cultivation of the vine, and the processes of wine-making in California. Commissioners and experts have visited foreign countries, and skilled workmen from leading European vineyards and wine-houses have been brought over here at great cost. Cuttings from all the rare vines of Europe have been imported, and all possible information respecting the cultivation of the vine, and the processes of wine-making, have been collected from every available source. Some species do not take kindly to this new climate and soil, while others appear to have gained new virtues; and although we cannot always expect that the identical flavor of the wine from the imported vine will be repeated in their new home, still many show a decided improvement. There are Rieslings in the market now, and some rare old white wines without a name in many a cellar, which, had their bottles been decked with the picture of some ruined old castle, might pass for a real Teutonic article from the banks of the Rhine. Other wines, like the Cucamonga of San Bernardino and the Angelica of Los Angeles, are noted for their luscious sweetness. Other blendings, like Kohler's or Baldwin's Bonanzas, have a quaint and fascinating flavor, while there are ports enough like their namesakes to defy comparison, and some sherries and muscatels which at no distant date will substantially supplant that class of imported wines in the United States.

As an illustration of the growing popularity of Californian wines at home, it is not too much to say that twenty years ago not ten gentlemen in the State ever placed either native wines or brandy on their table. Gradually, however, the white and red acid wines of Los Angeles and other counties improved, and were trusted; and now no Californian is ashamed of entertaining his guest with either the Sauterne, Hock, Muscatel, Zinfandel (claret), Riesling, or Burgundy of his native land. These wines are becoming favorites in the Eastern States, and even in England, and particularly among connoisseurs who know pure wines from adulterated ones. It also may not be generally known that certain French firms even export to their American customers red wines which were originally made in California, and shipped to France for the purpose of adulteration, or, at least, deception. The port wine from Los Angeles County is undoubtedly the best, purest, and truest port used in the country. It is palatable, medicinal in its effects, and purer than any port that comes from foreign countries, or that is manufactured in the cellars of importing-houses of New York and other Eastern cities. The Californian sherry is also gaining in favor, and its sale is daily increasing in the East; and what has just been said of the Californian port and the foreign article holds good for the sherry of California and its rival from abroad.

The excellence of the Californian vintages lies in their absolute purity, but they lack age and that exquisite manipulation which imparts to imported concoctions a mellow taste and an acceptable aroma. There is a nutty flavor to the so-called cheap sherry from abroad, that often pleases the senses more than that of the unadulterated sherry from California; and, while the former is actually guilty of deleterious effects, the latter is only deemed deficient in high-bred quality, which may be traced to its newness, and nothing else. Angelica wine from Los Angeles County has always been a favorite in the East, and is the wine that attracted the admiration of the jurors ot the Paris Exhibition in 1867.

There is no other vegetable growth in California which finds so generally a congenial place as the grape. It is a good bearer, and never fails if properly attended to. It never greatly suffers from cold or heat, or other elemental disturbance, and does not average one pound of decayed or indifferent berries in a thousand in the pickings. The vine suffers nothing from the elements, as a general rule; although whole vineyards in the lowlands, which have been primed too early, have been injured by frost, and so rendered non-producing for one season. The phylloxera has as yet occasioned

no alarm in southern California, and has never been known to have injured what is called the natural Californica, Arizonica, or Missouri vine or stock. No fertilizer is used by the viticulturists, as the soil is too strong, if any thing, to produce a grape which shall make a table wine with as little alcoholic percentage as possible.

Los Angeles County, while it has achieved much success during the past fifteen years in its production of hock, burgundy, and claret, excels more particularly in its port, sherry, madeira, angelica, and other sweet and heavy wines. The acreage of vineyards in southern California is always increasing.

Year.	Acreage.	Number of Vines.
1856	1,800	1,500,000
1879	56,000	45,000,000
1880	68,000	55,000,000
1881	80,000	64,000,000
1888	150,000	120,000,000

The wine product of these vineyards for the past eleven years was as follows: —

	Gallons.
1877	4,000,000
1878	5,000,000
1879	7,000,000
1880	10,000,000
1881	8,000,000
1882	9,000,000
1883	8,500,000
1884	10,000,000
1885	11,000,000
1886	18,000,000
1887	15,000,000
1888 (estimated)	17,000,000

In addition to the large quantity of wine and brandy manufactured, 85,000 boxes of raisins were exported from Los Angeles County alone, while the entire raisin pack for southern California amounted for the same period to 1,250,000 boxes, as compared with only 11,000 boxes in 1875.

BOOK-REVIEWS.

Chambers's Encyclopædia. New ed. Vol. III. Catarrh to Dion. Philadelphia, Lippincott. 8°. $3.

THIS volume, it is perhaps needless to say, maintains the same excellence shown in the two already reviewed in these columns. The number of illustrations is noticeable, as is also that of the maps, five of which are given. These maps, of China, Colorado, Connecticut, Delaware, and Denmark, show exactly what is wanted by the general user of maps, — the location of the chief political divisions and the towns, — very little or no attention being paid to the physical features. This is noteworthy in view of the tendency, on the part of some modern geographers, to lay special stress on the physical features, at least in school-geographies and in some atlases, but probably without due appreciation of the demand of the public at large that a map shall be a convenient diagram of the location of towns, counties, and states. It is doubtful whether it is often important to a person using an atlas whether even the rivers are carefully given. Rivers have ceased to have their former value as avenues of communication, having been superseded by railroads. It is likely, therefore, that a map showing the railways more clearly than the rivers would more nearly serve the purposes of ordinary every-day reference. We certainly indorse the maps as given in this volume.

A number of articles on American topics are specially copyrighted in the United States; and among these it is worthy of note that an addendum is made to the article on "Cheese," to cover American cheese, which is now so largely exported to England. "Dairy Factories" is another of these American articles, this being one more evidence of the development of entirely novel methods in this country for providing cheese and butter.

Grover Cleveland receives notice from an American pen; but it is a surprise to find so early an immigrant as Christopher Columbus treated of by one of our countrymen.

To indicate the character of the articles, we may mention that most of the geological ones are contributed by Professor James Geikie; the botanical ones, by Professor Patrick Geddes; the philosophical ones, by Professor Seth; and the legal ones, by Mr. Thomas Raleigh. Professor Rhys has written on the "Celts;" the Duke of Argyll, on "Clans;" Professor Legge, on "China;" Sir Edward Watkin, on the "Channel Tunnel;" Lord Brassey, on "Coaling Stations;" Lord Napier and Ettrick, on "Crofters;" Mr. Goldwin Smith, on "Cromwell;" Professor Nicholson, on "Currency;" Mr. E. W. Streeter, on "Diamonds;" Mr. A. J. Ellis, on "Dialect." The writers of literary biographies include the names of Walter Besant, A. H. Bullen, Professor J. W. Hales, George Saintsbury, and Theodore Watts.

Those who wish at hand a convenient reference-book, arranged by topics, and not made up of the elaborate treatises of some of the larger encyclopædias, should keep Chambers in mind.

Harper's First, Second, Third, and Fourth Readers. 4 vols. New York, Harper. 12°.

IF the rising generation is not properly educated, it will not be due to a lack of books. Publishers vie with each other in bringing out new school-books with all the improvements, both literary and mechanical, that experience and ingenuity can suggest. Under these circumstances, it is impossible that any one series of text-books should possess very decided superiority over others of the same class; and this is particularly the case with reading-books, on which so much labor has been expended. Nevertheless new readers will from time to time be needed, and the Messrs. Harper have sent us a series of them which they claim are superior in some respects to any hitherto prepared. The first of the series, which is intended for very young pupils, has been edited by Professor O. T. Bright; the editor of the others being Mr. James Baldwin. The volumes of the series are carefully graded, and the new words introduced in each lesson are given in a table at the end of the lesson, while a pronouncing and defining vocabulary of all the new words in the volume is placed at the end of the book. All the volumes are, of course, illustrated: and every means has been used to make them attractive to young persons, both in appearance and in their literary contents. The third and fourth numbers of the series contain many articles on history, the habits of animals, and other topics of importance; and in all the books moral lessons are inculcated as opportunity is presented. Throughout the series the attempt has been made to give the young reader really good literature, and the attempt has been attended with a good deal of success. Whatever may be the relative merit of these readers as compared with others, their positive merit seems to us of a high order.

Longmans' New Atlas. Ed. by GEORGE G. CHISHOLM. London and New York, Longmans, Green, & Co. 8°. $4.

THREE years ago we had occasion to remark favorably upon "Longmans' School Geography," by George Chisholm. The same author supplements his previous work most fortunately by the present atlas. Acting upon the advice of the Royal Geographical Society's committee, he has followed, as far as circumstances permit, German educationists; and the endeavor to make the best use of German works on school geography has led to excellent results in the present atlas. The author has evidently been guided to a great extent by "Sydow-Wagner's Atlas." The atlas is primarily designed for use in schools. With this view, three things have been aimed at as of chief importance, — first, the adequate representation of the physical features; second, the careful and somewhat exclusive selection of names; third, the facilitation of comparison as to size between the countries and regions included in the different maps. Physical features and political outlines are represented on the same maps.

In the selection of names the chief aim has been to insert no more than are necessary, and this aim has been kept in view not merely with the intention of rendering it possible to engrave all the names clearly in fairly large letters. The maps have in many cases been left comparatively bare in this regard, because every superfluous name tends to reduce the utility of a map for educational purposes. In school-maps it ought to be regarded as one of the first essentials that the names should be few. But the atlas

may also be used as a work of reference. For this purpose a great many more names have been included in the index than are named on the maps, their position being given by latitude and longitude.

The atlas is certainly of great value, and marks a new departure in the teaching of geography in higher schools. While we acknowledge the full importance of the work as a whole, we have to remark on a few minor points. The first of these is the lack of uniformity in the use of colors. Thus the author designates depressions by approximately the same color which is used for land between 500 and 1,000 feet on other maps. Furthermore, we miss throughout a uniformity of treatment of the depths of sea. In the contour-line maps of England, Ireland, and Scotland, the hundred-fathom line only is indicated, no additional details being given to the map of western Europe. It is the object of lines of equal depth to continue the representation of the earth's surface under the level of the water: therefore lines of height and of depth must be given in equal detail. The same applies to the other maps of the atlas. Map 3, illustrating methods of hill-drawing, is evidently an imitation of the corresponding map of "Sydow-Wagner's Atlas;" but it compares very unfavorably with it, the hachures in the various engravings of the same region not representing the same slopes and even configuration. An appendix contains a great number of typical views of landscapes, towns, products, and human races.

AMONG THE PUBLISHERS.

A DESPATCH from the City of Mexico reports that Adolph Sutro, of Comstock Mine and Sutro Tunnel fame, who is travelling in South America, bought in an old bookstall in that city what is claimed to be a genuine copy of the first folio edition of Shakspeare for an insignificant price.

— Messrs. Cassell & Co. will publish at once a new edition of William Robertson's "Life and Times of the Right Hon. John Bright," which has been brought down to date by a well-known American writer. The adding of the last lines to these chapters has been held back to await the death, which has been for so long anticipated. Mr. Robertson had especial advantages for writing this life of the great reformer and statesman, and it reads with all the absorbing interest that attaches to the well-written biography of a great man. The frontispiece of the book is a portrait of Mr. Bright taken from a recent photograph. A few proof impressions on India paper, suitable for framing, of the etching from the famous Ouless portrait of John Bright, are offered for sale by Messrs. Cassell & Co. The original painting is owned by the Manchester Reform Club, by whose kind permission it was etched.

— Harper & Brothers will publish in May the second volume of Justin McCarthy's "History of the Four Georges."

— J. B. Lippincott Co. have nearly ready an anonymous story entitled "John Charáxes." Some who have seen the work think that its familiarity with Boston society, traditions, etc., the peculiar religious and political views occasionally expressed, and the scholarly style, point to the eminent lawyer, George Ticknor Curtis. This accords with certain rumors which have recently been afloat regarding his intention to write a novel bearing somewhat on the questions culminating in the civil war.

— Houghton, Mifflin, & Co. will publish next week Miss Howard's novel, "The Open Door;" an important religious work by Professor J. F. Weir of Yale, entitled "The Way: the Nature and Means of Revelation," a thoughtful book of the "New Theology;" "Prolegomena and an Index to In Memoriam," a book of notes on Tennyson's great poem; and a new edition of the reliable "Satchel Guide to Europe," carefully revised and printed from wholly new plates. They bring to the attention of the trade and the public Dr. Holmes's admirable memoir of J. L. Motley.

— Charles Scribner's Sons have just ready the second volume of Dr. M. R Vincent's "Word Studies in the New Testament," treating of the writings of John. The purpose of the author of this work is to enable the English reader and student of the New Testament and of the Bible to get at the original force, meaning, and color of the significant words and phrases as used by the different writers. They have also just issued a volume of musical essays entitled "Chopin, and Other Musical Essays," by Henry T. Finck, author of "Romantic Love and Personal Beauty," who in this volume discusses such timely questions as German opera in New York, and the differences between the German and Italian vocal styles, as well as Chopin, Schumann, and the philosophical relation between music and morals. They will publish shortly J. A. Froude's new historical novel, to be entitled "The Chiefs of Dunboy." The period is the middle of the last century, and the characters include Irish exiles who have taken refuge and acquired influence in France, which they use as a base of supplies in their intermittent warfare against England. It will be issued in cloth and in paper bindings simultaneously with its appearance in England, being the first volume which the Scribners have issued for some time among their yellow-cover paper novels.

— The March number (No. 41) of the Riverside Literature Series (published monthly at 15 cents a number by Houghton, Mifflin, & Co., Boston) contains "The Tent on the Beach," and other poems, by John Greenleaf Whittier, with notes especially arranged for this edition. "The Tent on the Beach" tells of a summer holiday, spent by Whittier and his friends Bayard Taylor and James T. Fields; and in the poem, which by many is considered one of Whittier's best, some characteristics of these writers are very interestingly described. The other poems, among which may be mentioned "The Wreck of the Rivermouth," "The Grave by the Lake," "The Maids of Attitash," and "Abraham Davenport," are principally

> "Legends and runes
> Of credulous days, old fancies that have lain
> Silent from boyhood taking voice again,
> Warmed into life once more, even as the tunes,
> That, frozen in the fabled hunting horn,
> Thawed into sound."

— A group of articles on fishing will begin in *Scribner's* for May, with a paper on "The Land of the Winanishe," by Dr. Leroy M. Yale of New York, and J. G. Aylwin Creighton of Quebec, who will describe a fishing-trip to Lake St. John after land-locked salmon. This region was recently made accessible to sportsmen by a new railway. Eugene Schuyler will publish in the same number some reminiscences of "Count Leo Tolstoï Twenty Years Ago." Mr. Schuyler was a visitor at Tolstoï's home, and had many long and intimate conversations with him, which are now for the first time published. The recollections will be concluded in the June number. Charles Eliot Norton of Harvard will contribute the end paper, the subject being "The Lack of Old Homes in America," and the associations and sentiments of which we are thereby deprived.

— T. Y. Crowell & Co. will publish at once a new edition, in paper covers, of "My Religion," by Count L. N. Tolstoï. This book, which was the first to attract attention to Count Tolstoï's remarkable personality, immediately caused more discussion than any other work of its kind that has been published since "Ecce Homo."

— The editor and publisher of the *International Ethnographical Archive*, not content with publishing yearly six magnificently illustrated and printed numbers, propose to issue supplements as occasion may offer. The first of these contains a learned description of the Indians of Guatemala, by Dr. Otto Stoll, whose studies on that country have won him so well deserved renown. The author treats fully, on the ground of his extensive observations and studies of literature, the social organization, religion, the practices of war, technology, and trade of the ancient inhabitants. The chapter on technology is admirably illustrated by two chromolithographs. The author describes the division of land among the gentes, — the chinamit, — the laws of marriage, terms of relationship, government, and the social position of the common men and of slaves. The chapter on religion is a very clear and succinct representation of what is known on this important subject, the famous Popol Vuh receiving its due attention. Psychologists will be particularly interested in the chapter on "Suggestion and Hypnotism," which phenomena are so widely spread among primitive people, but have not yet received their proper share of attention.

— The recent volume of the *Meddelelser om Groenland* contains two papers of great importance, which shed an entirely new light upon several ethnological questions referring to the Eskimo. The first of these papers is a collection of tales and traditions from Angmagsalik, on the east coast of Greenland, where the Danish expedition under Capt. G. Holm spent a whole winter; the second is a discussion of the vocabulary collected at this place by Dr. H. Rink. The tales are very much of the same character as those collected in other parts of Arctic America. Some of them are identical with tales from West Greenland and Labrador, while others are mainly new combinations of parts of well-known tales The vocabulary is particularly interesting, on account of the great number of new terms for the most common objects. Most of these terms are descriptive names, the word which is used in all other dialects having become extinct. Thus, instead of "berry," the East-Greenlanders say "that what is picked;" instead of "hand," "limb;" for "tail," "end;" instead of "mother," "origin;" and many others. Similar words are used by the Eskimo shamans of other regions, but this is the only place where they have to a great extent superseded the common words. A great number of these words may have come into use, when, after the death of a man, people avoided mentioning him and his property; but others may simply have been taken from tales, and adopted for ordinary use. It is remarkable, that, in consequence of this custom, the East Greenland dialect has many features by which it differs from all other dialects. This fact must be considered a proof of a long isolation of this tribe.

— Fred H. Whipple, Detroit, Mich., will issue in June a complete directory of the electrical fraternity, including every person in every branch of the trade, and proposes to supplement this monthly, until the next annual number, with commercial reports embracing the doings of the electrical world up to date. These reports will be in the nature of confidential bulletins on the progress of the business world, confined entirely to matters electric, and will be sent only to annual subscribers.

— It is stated that throughout Asia Minor there are splendid opportunities for the introduction of machinery, the field at present being entirely unoccupied. There is a great abundance of water-power in the country, although at present it can hardly be said to be utilized. According to *The Timber Trade Journal*, there is not a board of any sort, or even a plank or beam, ever sawed there by any other power but that of the human hands: there is therefore a good opening for wood-working machinery. There ought also certainly to be an opportunity for agricultural-implement makers to introduce their products into Asia Minor, as such implements as are at present in use there are of the most primitive description. The spades and shovels are made of wood, each being cut out of one solid piece of timber. The ploughs are also of wood. Indeed, such implements cannot be called "ploughs" at all, as they are only pointed sticks, which comparatively seldom have even an iron-pointed cap upon the point which scratches, and it is supposed to turn over the soil. Manchester supplies most or perhaps all the cotton prints which are imported, and great quantities of which are used for clothing, divans, bedding, and such like purposes.

— Messrs. Kelso & Co., Glasgow, we learn from *Engineering*, have just completed the construction of the dynamometric apparatus in connection with the experimental tank being built at Spezzia for the Italian Government. This tank is similar in general details to that constructed by the British Government at Gosport, and by Messrs. William Denny & Brothers at Dumbarton, on the principle of Dr. Froude. The experimental tank at Spezzia is 500 feet in length, which is 100 feet more than that at Gosport, and the breadth is about 22 feet. The use of the tank is to determine the form of ship which shall have the least possible resistance at a certain speed, conforming to practical considerations, and to ascertain the relation of power to speed with the form of ship under consideration. The model having been constructed of paraffine, and faired by a specially designed machine, is tried in the tank by means of a dynamometric apparatus to measure the resistance of the models at varying speeds corresponding to the required speeds for the full-sized ship. The apparatus is mounted on a carriage, which also supports the arrangement for measuring the rise and fall of the bow and stern of the model in its progress through the water. The chief novelty lies in the framework. The rails or platform on which the apparatus runs at Messrs. Denny's tank, are suspended by means of tie-rods from the joists of the tank; whereas at the new Italian tank the rails are placed at either side of the tank, which allows of the framework being so constructed as to afford an unobstructed view of the whole water behind, with the waves and currents. For accurately recording on a revolving cylinder the speed at which the model is running, electric arrangements have been supplied, the current being from a battery of Leclanché cells, carried on the lower table of the resistance truck. The circumferential travel of the cylinder is a function of the speed of the carriage supporting it, and on it is also recorded the resistance diagram, which is obtained by the extension of a helical spring attached to the dynamometer. There is an automatic arrangement for lifting and lowering the pens on the diagram and revolving cylinders. It may be added that the dynamometer of Messrs. Denny's tank was also supplied by Messrs. Kelso from plans by Mr. Froude.

— According to a parliamentary paper, entitled "Statement exhibiting the Moral and Material Progress and Condition of India," an abstract of which appears in the *Journal of the Society of Arts*, London, progress in education continues in India. The number of schools and colleges rose in 1887 to 127,381, as compared with 122,643 in the year 1886, and the total number of scholars to 3,358,042, as compared with 3,339,061. Of this total, only about 150,000 were girls; but the increase in the number of girl scholars has, during the last three years, been in a much larger ratio than the increase among the boy scholars. A new university was opened at Allahabad in 1887, and India now possesses five universities, all of which hold examinations and grant degrees. The number of candidates for admission to the universities rose from 13,254 in 1886, to 14,732 in 1887, and the number of admissions from 4,231 to 6,224. The number of students who gained university degrees in 1887 were 826 in art and science, 80 in medicine, 37 in engineering, and 193 in law. A large number of medical students obtained diplomas as hospital assistants in 1887, besides those who graduated in medicine. Of the Calcutta graduates in arts during 1887, two were women. The number of secondary or higher schools for boys has risen during the last five years from 3,932 with 215,731 pupils, to 4,160 with 404,189 pupils: during the same period the secondary schools for girls have risen from 190 with 6,366 pupils, to 357 with 24,904 pupils. The most important technical schools are the workshops at the great railways, at which some hundreds of apprentices, many of them holding scholarships or stipends from government or from local bodies, are learning mechanical engineering, smithy work, and carpentry. The number of pupils at engineering colleges and at art schools is very small, but the teaching of drawing and of surgery is being extended in most provinces. Now that primary and secondary schools are mostly under the control of municipal and local bodies, it is expected that technical teaching in the special handicraft or manufacture of each locality will be gradually increased.

— The American Statistical Association possesses a statistical library, the result of forty years' collection, which is designed as a depository for statistical works of every nature. At present the library is placed in rooms 31–33, Rogers Building, Massachusetts Institute of Technology, Boston. Its collection embraces not only the publications of the United States, but also many valuable reports issued by statistical bureaus of foreign countries. It also includes the very valuable statistical library collected by the former president, Dr. Jarvis, and bequeathed to the association upon his death, in 1884. It is believed that the collection and preservation of reports which admit of a classification according to statistical groupings, will be of great public service, and the association earnestly requests a generous co-operation in still further enlarging the library in such directions. Reports of vital and social statistics, registration reports, census documents, municipal reports, documents relating to public works, reports of trade, commerce, taxation, finance, insurance, industry, labor, health, crime, education, and religion, are especially desired.

— The *Quarterly Journal of Economics* for April opens with an article by F. W. Taussig, on "Some Aspects of the Tariff Question," in which the writer considers what effect the protective tariff has had in establishing, or helping to establish, certain industries. He shows that some branches of manufacture, such as that of silk goods, for instance, have been strongly stimulated by it; while other industries, among which the culture of flax fibre is conspicuous, have utterly failed, notwithstanding the high duty on the imported articles. Professor Taussig's conclusion is that international trade is really controlled, as the economists have always held, by the comparative cost of different commodities. Mr. Philip H. Wicksteed discusses "Certain Passages in Jevons's 'Theory of Political Economy,'" criticising some of Jevons's views, while agreeing with him as to the use of the mathematical method. The next article is on "Co-operative Savings and Loan Associations," by Seymour Dexter, and is mainly a description of such societies, which the author regards as one of the best forms of co-operation. He points out, however, that they have nowhere had very marked success except in Pennsylvania, — a fact which he attributes to certain superiorities in the laws of that State. Mr. James Bonar gives an abstract of a new theory of capital, recently advanced by the Austrian economist, Böhm-Bawerk. The problem is to account for interest, and the Austrian professor holds that it arises from the fact that future goods are not really so valuable as present goods otherwise identical. A dollar that I am to receive a year hence is not so valuable to me as a dollar in my pocket now; and therefore, if a man loans his capital, say for a year, he will demand at the end of that time not only the full value of his capital, but also an additional bonus, called interest. This theory is put forward as a new one; but we cannot see that it differs essentially from that of the English economists. They have always held that if a man loaned his wealth, or used it in production, so that he had to wait for its value to be returned to him, he would demand a recompense for waiting; and Professor Böhm-Bawerk's theory, as stated by Mr. Bonar, seems to be only a new expression of the same principle. The journal closes with the second part of Mr. A. B. Houghton's essay on "Italian Finances from 1860 to 1884," — a paper containing a great amount of historical and statistical matter which will doubtless be useful to special students.

— A writer in the *Fortnightly Review* for March, speaking of the character of the Boers, says that it is considered perfectly correct to "do" the Boers. In the first place, money was perfectly useless to them, as they only keep it in gold in chests inside their bedrooms, and are constantly uneasy about it; second, the sons were only led into drinking and bad habits by having ready cash; and, lastly, it was impossible sometimes to deal with them otherwise. As an instance, there is a case where a Boer farmer asked for his farm, upon which gold had been discovered, the exorbitant sum of £50,000. If the buyer had refused, the obstinate man would never have abated the price; so he said he must think it over. Shortly afterwards he went to the bank and took out £6,000 in half-sovereigns, in twelve bags of £500 each. He drove up with these to the farmer's house, and took out ten of the bags, and said, "I have come to buy the farm." — "Have you brought £50,000?" said the farmer. "Well," said the Jew, "I have brought a lot of money; I will put it on the table." He then poured out the £5,000 in half-sovereigns. The farmer and his vrow looked on, and their eyes glistened as they looked at the table covered with gold. "How much is there?" said the vrow. "You had better count it," said the Jew. Of course, that was impossible; so the vrow said, "Could you not give us some more bags?" — "Well," said the Jew, "I must see if I have any more." Then he told the boy to bring one bag out, and he purchased the farm for £5,500.

— Messrs. Putnam have issued "Virgil's Æneid, the First Six Books," translated into English rhyme by Henry Hamilton. The narrative parts of the poem are in the ten-syllable couplet, and the speeches in a great variety of verse, changing with each recurring speaker. The object of this frequent change of form is to give variety to the English work; but as the original is all in one metre, and that radically different from any employed by Mr. Hamilton, there is nothing in the versification to remind us of Virgil. The author complains that Conington's translation "by no means reproduces the sonorous effect of the Latin hexameter; but in what respect his own does so, we are unable to see. With several translations already in the field, we can see no good reason for a new one, unless it is fitted to supersede the others, which we fear is not the case with Mr. Hamilton's.

— What is claimed to be Miss M. G. McClelland's strongest story will be published by Cassell & Co. within a few days. It is called "Burkett's Lock." It is a story of the home; and as a picture it is believed that "Burkett's Lock" will make a sensation among the novel-reading public that they have not experienced in a long time, for it has a story in it, and a story well told. The scene is laid in Virginia, where Miss McClelland is so thoroughly at home, and her characters are drawn from the people, who are native to the soil.

— According to statistics published in *The Publishers' Weekly*, the following is an estimate of the new books published in Russia in 1888: philosophy, 26; education, 86; philology, 420; fiction, 818; geographical works, 211; history, 413; political science, 368; mathematics, 153; military, 202; natural sciences, 168; medical, 454; technological literature, 127; domestic economy, farming, etc., 121; books for children, 115; books for the people, 217; fine art, 139; miscellaneous, 448; total, 4,486. This does not include the literature published under ecclesiastical censorship, which naturally comprises theological books; nor are the books accounted for which did not circulate through trade mediums. It may therefore be assumed that the total number of books issued amounts in round numbers to five thousand volumes.

— The general outcome of a paper on "The Viscous Effect of Strains Mechanically applied, as interpreted by Maxwell's Theory," published by C. Barus in the *Philosophical Magazine* for February, is this: that the effect of strain of whatever kind, applied in sufficient intensity to homogeneous soft steel, is marked diminution of viscosity. Again, inasmuch as the underlying cause of viscous deformation is the occurrence of unstable configurations, the number of which is being reduced in the course of viscous motion, Maxwell's theory naturally suggests the applicability of exponential equations for the description of the time relations of such motion. From another point of view, it appears that the loss of viscosity experienced by a given metal, under action of a given kind of strain, may not inappropriately be used as a measure of its intensity. Finally, the curious observation, that, in all the cases given, loss of viscosity has taken place simultaneously with increase of hardness, is one of the suggestive results of the experiments made.

— W. J. Campbell, Philadelphia, will publish early in May a new improved edition of "Grant's Pennsylvania Reports," in three volumes.

— The Rev. John George Wood, the well-known naturalist, died recently in England. The deceased did perhaps more to popularize the study of natural history than any writer of the present age. He was the son of a surgeon who was at one time chemical lecturer at the Middlesex Hospital, London. He was born in London in 1827, and was educated at Oxford. His most important book was his "Natural History," in three volumes. Mr. Wood edited for some time the *The Boys' Own Magazine*, the pages of which periodical constantly contained work from his hands. He left no fortune, and a popular subscription in aid of his family has been started.

— "The Emperor of China," says the *Athenæum*, "has just issued orders for the preparation of a history of the Mohammedan rebellions in Yunnan, Kansuh, Shensi, and Turkestan, and five members of the Grand Council have been named as the committee to whom the work is intrusted. Similar official histories have already been written of the Taeping and Nienfei revolts."

— The Liege Chamber of Commerce has recently set an example, says the *Journal de la Chambre de Commerce de Constantinople*, which might well be followed by other industrial centres. It has established a commercial museum on an entirely new system. This museum is divided into two sections. The first comprises the articles that Belgium is obliged to purchase from other

countries, while the second contains samples of all the articles which are manufactured in Belgium. A library and an information bureau are attached to this museum.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

Twenty copies of the number containing his communication will be furnishea free to any correspondent on request.

The Robinson Anemometer.

SO long as the anemometer law is purely empirical, it is doubtless largely a matter of individual taste that one should prefer to use a series of ratios whose values, even within the limits of ordinary usage, range between infinity on one hand, and 2.89 on the other, — a value which corresponds, according to *Science* of March 22 (p. 227), to a wind-movement of 25 miles per hour. Nevertheless occasion may be taken at some future time to point out a possible error into which one is easily led by use of this variable factor.

It seems, my "explanation of the effect of a uniform wind blowing across a whirler upon which an anemometer is being tested is very surprising;" indeed, I have wondered myself that so simple an explanation had not been suggested long ago. That it is "entirely untenable" cannot be admitted, since it is only made to appear so by my critic, who unfortunately omits from the very heart of the statement whose accuracy he questions, three very important words. Nothing more than this need be said. I am well aware, also, that "it has generally been considered that while these cups [of the anemometer] never respond instantly to the wind, and continually lag behind while the wind is rising, yet their momentum keeps them up, and about counterbalances this lagging while the wind dies down;" but that these effects about balance is exactly what does not occur, and therein is the novelty of the explanation I have suggested.

The substitute offered in *Science* of April 5 (p. 268) is based partly on an incorrect statement; namely, that a wind blowing directly at right angles to the path along which an anemometer is being carried will add its effect to that due to the motion of the anemometer. If the writer means that the sum of the two separate effects are to be taken, he is entirely wrong. It is a simple question of the resultant of two forces at right angles to each other, which is not the sum of the two separate forces. With this as a partial basis, the explanation is developed, and the astonishing conclusion reached that "the anemometer will be accelerated during more than three-fourths of the rotation [presumably of the whirler], and retarded during less than one-fourth of it." Had the author, in accordance with the principle of the parallelogram of forces, found the resultant of the two wind effects that act simultaneously upon the anemometer at each point of its path, and integrated or summed these up for a complete revolution of the whirler, he would doubtless have arrived at a much more accurate conclusion, — a conclusion that the ultimate resultant effect for a whole revolution "is only small in most cases, and is not very serious," as given in my original letter in *Science* of March 29; a view, moreover, that is entertained by Professors Dines, Stokes, and others who happen to have written on the question.

Even admitting that the explanation under discussion is correct, it does not account for the uniformity of the results obtained in England with the helicoid anemometer, which, being provided with a vane or tail, always presented its front directly to the resultant wind. The Robinson anemometer, from its construction, has no need of a tail, and the two instruments are circumstanced exactly alike so far as being equally subject to the resultant wind. It is presumed throughout this and previous papers that the axis of the Robinson anemometer is vertical or nearly at right angles to the plane of rotation of the whirler. The analysis of the problem is a little different when the axis is inclined more or less to the vertical, but the final result is practically the same.

Having several weeks ago submitted a paper containing in detail the various experiments and results that led to the development of the explanation given in *Science* of March 29, I do not desire to cite here any experimental confirmation of the theory, nor do I consider that the results given by Professor Hazen in any way disprove the theory. Why one should expect to be able to use the same formula for cone-shaped paper cups as had been found applicable to hemispherical metal cups, or should be surprised at a difference of twenty per cent less wind-velocity, does not appear.

Following the example of Professor Hazen, I intend to try some experiments with hemispherical paper cups, and have thus far completed a set; but the pressure of other duties has not afforded me opportunity to do more as yet.

C. F. MARVIN.

Washington, D.C., April 8.

The Metric System and Professional Teaching.

THE committee appointed at the Cleveland meeting to consider the relations of chemistry to public instruction, naturally have their attention called to the metric system of measures. No doubt the familiarity of the public with this system has much increased since 1866, when the Act of Congress was passed making it legal; but recent conversations with parties who might be supposed well posted on the subject show some views that appear to the writer incorrect, and adapted to retard the adoption of a much-needed reform.

A very prominent teacher of chemistry said he was not an advocate of its general use, and that no time would be saved in the instruction of children by such adoption. The Metric Bureau, in their leaflet, stated that "a year of the school-life of every child would be saved by the adoption of this system." This statement was made by teachers. I do not know its basis; but there are, in the English system of tables we use, about fifty factors to be memorized. As there is but one factor in the metric system, and that the same as our system of numeration, necessarily fifty times as much time is required to learn English measures as metric. If the Society for Psychical Research can tell us the average time required to memorize an idea, we should then know the saving of time in instruction, that would follow the adoption of the metric system.

An apothecary assured me that the adoption of parts by weight in the new pharmacopœia, with which he connected in some way the metric system, had, in his judgment, done great harm to the drug business: for, he said, the wholesale manufacturers put on the outside of their bottles that one part of this extract, etc., with nine parts distilled water (or required proportions), would make ten volumes of the officinal strength. The extreme simplicity of this process, my friend argued, reduced the drug business, so far as intellectual qualifications are concerned, below the grocer, and the metric system was somehow held responsible.

The metric system is in universal use by chemists. The arts of medicine and pharmacy are dependent on chemistry for their materials and their processes. As matters now stand, every student in the colleges of these arts is obliged to learn two new tables of measures, — apothecary and metric; for I assume that all professors of chemistry teach the metric, and some professors of materia medica also. In other schools the chair of chemistry teaches one, and the chair of materia medica the other system.

Is it not time to inquire if this is a rational condition of things? It will not do to say the apothecary weight is learned in the primary school. The metric is taught also, at the present time. Both are usually forgotten before the student matriculates. Neither can it be said that we break away from the system of our English cousins, for our fluid measures are not the same as theirs, now that they use the imperial gallon. There remains the single argument against the metric system in our professional schools, that it is not in general use by physicians. Those who do use it find the gram a most convenient unit. The difficulty of inducing a large body of men to change some of their basic elements of thought seems to be the greatest obstacle to a beneficial improvement.

Now, why not let the old doctors use the old system, but teach the graduates only the new; then add to the pharmacy laws a clause requiring every druggist to provide himself with a set of metric weights, making this condition as indispensable as a diploma? At present, when a prescription is presented in the met-

ric system, most druggists translate it into apothecary weight, and feel aggrieved that they are put to extra trouble thereby. If they had the weights, very many would use them sufficiently to become acquainted with their practical advantages, and thereby add their influence to the advancement of the reform. At present many who acknowledge the advantages of the metric weights, and would gladly see them used, do not have quite the energy required to actively push the change.

It is not understood by some that the object is to entirely supplant the present weights, not to make an addition to our stock. It seems very hard for them to realize that the particular set of arbitrary quantities, in which they happen to think, will in a few years pass into history along with cubits and sesterces, and be equally forgotten. It will be greatly to the advantage of all concerned to hasten this time as much as possible. Just now it seems as if the change was taking place rapidly in some of the mechanical arts; and the following quotation from the *Journal of Engineering Societies* is so apropos, that we add it as summing up the whole matter: "The Western architects prefer decimal subdivisions, because of greater ease in written operations, greater certainty and rapidity in mental operations with numbers of measure, decreased liability to error in figuring drawings (prescriptions), and a general saving of time and anxiety."

How well the above statement would apply to medicine and pharmacy! Simply let all teachers of pharmacy and materia medica agree to omit entirely all reference to the apothecary system of weights and measures, and adopt the law above stated, and the metric system will come into use, and the other die without a struggle. WM. H. SEAMAN, M.D.

Howard Univ., Washington, April 3.

Platinum in British Columbia.

IN connection with the article on platinum in *Science* for March 29, it may be of interest to some of your readers to know that platinum is found in association with gold in placer deposits in a number of localities in British Columbia, and that the most important occurrence of that metal yet met with in North America, so far as I am aware, is that of the Tulameen and Upper Similkameen in that province.

In the "Mineral Resources of the United States for 1887," Mr. David T. Day states that in consequence of inquiries set on foot for crude platinum, a total quantity of 448 ounces was obtained in that year in the United States. Part of this amount was purchased in Oregon, and part is stated to have been derived from British Columbia. This latter portion, no doubt, came from the particular region to which allusion is here made; for, though found in other places in British Columbia, it is here only that the quantity has been such as to induce the miners to collect and market it. The total product of the Upper Similkameen and Tulameen district in 1887 is estimated at from 1,400 to 2,000 ounces, and in 1888 at 1,500 ounces.

Placer gold-mining has been carried on in an intermittent manner in the district in question for many years, the gold found being generally scaly or "fine," and being invariably accompanied by a certain quantity of similarly "fine" platinum. In 1885, however, "coarse" gold was discovered on Granite Creek, a tributary of the Tulameen, and in association with it similarly "coarse" platinum, in grains and pellets which are sometimes as large as a pea; the platinum in some "claims" being present in quantity equal to half that of the gold obtained, by weight. Since this discovery, the platinum, which was formerly thrown away, has been kept and sold separately, the price obtained averaging about three dollars an ounce.

As is usually the case, the platinum here found is alloyed with several other metals of the same series, and with copper and iron. The metals of the platinum series include osmiridium (in considerable quantity) with paladium, rhodium, and osmium to lesser amounts (according to analyses by Mr. G. C. Hoffmann, *Transactions of the Royal Society of Canada*, vol. v. sect. iii. p. 17; *Annual Report of the Geological Survey of Canada*, 1887, p. 5, T.).

During the summer of 1888, I had an opportunity of examining the localities of occurrence of platinum here described, and, without entering into particulars, I may state that its association and distribution point very strongly to a mass of coarse intrusive diorite, which contains much magnetite in a disseminated form as well as in veins reticulating through it, as the source of the platinum. In consequence of the extreme rarity of this metal in its original matrix, this subject appears to be one of particular interest, and it is intended further to investigate it. GEORGE M. DAWSON.

Geological Survey of Canada, Ottawa, April 5.

The Age of the Denver Formation.

I HAVE read with much interest the article in the April number of the *American Journal of Science and Arts*, by Mr. W. Cross, on a formation which occurs near Denver, Col., which he calls the "Denver formation." It appears to be stratigraphically distinct from the Laramie formation, from which it is separated by an intervening deposit, the Willow Creek bed. Paleontological evidence is available from three sources, — the plants, the *Mollusca*, and the *Vertebrata*. The plants according to Ward, and the *Mollusca* according to White, do not differ from those of the Laramie, and most of the *Vertebrata* have the same character. The formation has, on the other hand, yielded some fossils which have been referred to the mammalian genus *Bison*, and described and figured under the name of *B. alticornis* (*American Journal of Science and Arts*, 1887, p. 323) by Professor O. C. Marsh. On the strength of this determination, Professor Marsh identifies the horizon with the pliocene.

This was the first determination made in recent years. When subsequently dinosaurian bones were reported from these beds, a great deal of discussion was aroused, and the persistence of this mesozoic type of *Reptilia* into cænozoic time was proposed and maintained in some papers of a fugitive character.

Several years ago I had the opportunity of examining remains of *Vertebrata* from near Denver and Golden, and they were clearly dinosaurian, and of the types which belong to the Laramie system. How is it possible, then, that a species of *Bison*, a pliocene genus, could occur in the same bed? The explanation is as follows.

In 1875 I published an account of the *Dinosauria* obtained by me east of Denver, in the Laramie formation. They included three genera, — *Hadrosaurus*, and two new ones, *Cionodon* and *Polyonax*. Subsequently, in 1878, I described parts of the skeleton of a dinosaur from near the Judith River, Montana, which was furnished with robust horn-cores. All of these types were figured in the "Final Report and Bulletin of the United States Geological Survey of the Territories." Thinking that this horned reptile would be found to belong to one or other of the nine genera of *Dinosauria* already described by Leidy and myself from the Laramie, I refrained from naming it.

Material recently obtained and described by Professor Marsh goes to show that the horned dinosaurs belong to the genus *Polyonax*, Cope; and not only this, but that the *Bison alticornis* belongs to it also. That the latter species is not a mammal is indicated by the characters of the brain-case figured by Marsh.

Thus is removed the only obstacle to the reference of the Denver and Willow Creek formations to the Laramie system.

E. D. COPE.

Philadelphia, April 4.

Platinum in Place.

IN *Science* for March 29, p. 232, the finding of platinum *in place* is commented on. The following extract from Wurtz's "Dictionnaire de Chimie" (vol. ii. p. 1035) may be interesting: —

"Le platine a été trouvé en place par M. Boussingault dans les filons aurifères de Santa-Rosa de Osos en Colombie. Ce sont des filons de quartz hyalin et de limonite traversant une roche de syénite ou de diorite; en Sibérie, MM. G. Rose et Leplay ont toujours trouvé le platine dans les vallées ouvertes au milieu des roches serpintineuses."

Dana ("A System of Mineralogy," 5th edition, p. 11) says, "In Nischne Tagilsk, it [platinum] has been found with chromite in serpentine." W. G. BROWN.

Washington and Lee Univ., Lexington, Va., April 3.

Publications received at Editor's Office, April 1–16.

CAMPBELL, Helen. Under Green Apple Boughs. (Ticknor's Paper Series, No. 54.) Boston, Ticknor. 272 p. 16°. 50 cents.

CHAMBERS'S ENCYCLOPÆDIA. New ed. Vol. III. Catarrh to Dion. Philadelphia, Lippincott. 828 p. 8°. $3.

DOLARO, Selina. Bella-Demonia. Chicago, New York, and San Francisco, Belford, Clarke, & Co. 265 p. 16°.

FIGUIER, L. L'Année Scientifique et Industrielle, 1888. Paris, Hachette. 636 p. 12°. (New York, Christern.)

FOOTE, A. R. Economic Value of Electric Light and Power. Cincinnati, Robert Clarke & Co. 191 p. 12°. $1.

GROH, I. W. Did Man Fall? The Location and Topography of the Garden of Eden a Fact Is the Garden also a Fact? $5,000 Reward. New York, Truth Seeker Co. 21 p. 16°. 10 cents.

HAMILTON, H. Virgil's Æneid. The First Six Books translated into English Rhyme. New York and London, Putnam. 197 p. 12°.

HARPER'S First Reader. In 2 parts. New York, Harper. 144 p. 12°.

—— Second Reader. In 2 parts. New York, Harper. 208 p. 12°.

—— Third Reader. In 2 parts. New York, Harper. 316 p. 12°.

—— Fourth Reader. In 2 parts. New York, Harper. 420 p. 12°.

LETCHWORTH, W. P. The Insane in Foreign Countries. New York and London, Putnam. 374 p. 8°. $3.

LIMITATIONS of Toleration, The: A Discussion between Col. Robert G. Ingersoll, Hon. Frederic R. Coudert, and Ex-Gov. Stewart L. Woodford. New York, Truth Seeker Co. 44 p. 16°. 10 cents.

MARTIN, T. C., and WETZLER, J. The Electric Motor and its Applications. 2d ed. New York, W. J. Johnston. 282 p. 4°.

NATIONAL Economist, The. Vol. I. No 1. *w.* Washington, Nat. Econ. Publ. Co. 16 p. f°. $1 per year.

NATIONAL Educational Association, Proceedings of the Department of Superintendence of the, at its Meeting in Washington, Feb. 14–16, 1888. Washington, Government. 165 p. 8°.

NEWELL, Jane H. Outlines of Lessons in Botany. Boston, Ginn & Co. 140 p. 16°.

O'BRINE, D. A Laboratory Guide in Chemical Analysis. 2d ed. New York, Wiley. 237 p 8°. $2.

SALTUS, E. A Transaction in Hearts. New York, Chicago, and San Francisco, Belford, Clarke, & Co. 188 p. 16°.